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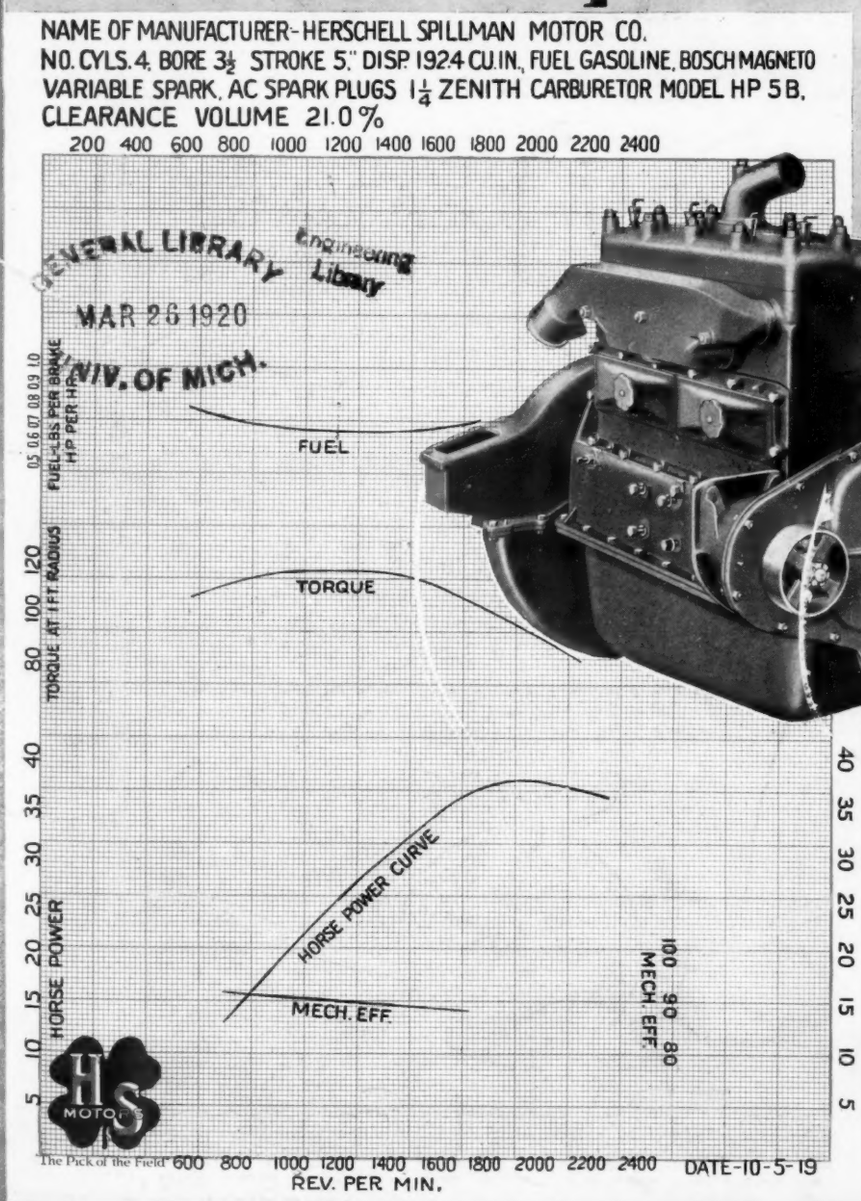
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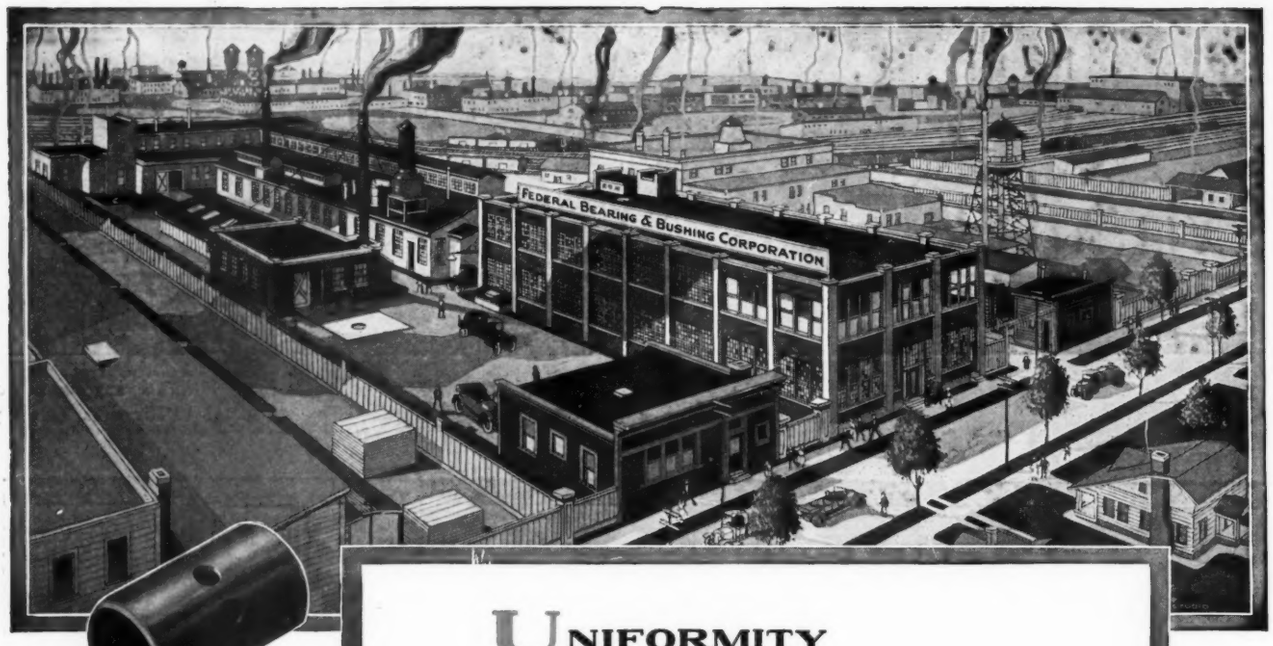

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AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XLII NEW YORK—THURSDAY, MARCH 18, 1920 NO. 12

Shall We Put the Airplane to Work in America?

The future of the aviation industry in this country depends upon the success of the manufacturers in taking advantage of the transportation opportunities before them. This article reveals some of the results of the recent aircraft show in New York and discusses the problem of the commercial airplane.

THE American Airplane must go to work as quickly as possible.

The contact of engineers, builders and traffic men last week on the occasion of the exhibition conducted by the Manufacturers' Aircraft Association at New York, to a large extent clarified the methods whereby this can be done. Three distinct phases of the developments will be considered here.

1. The manufacturers asserted that the reliability and maintenance of their machines, while not yet ideal, had been greatly improved from the military standpoint. The life and accessibility of engines have been greatly improved and one manufacturer said that he believed that the life of his engine might reach 2000 hr. with overhauls. Guarantees, however, have not reached that point and the statement was not made for publication but in confidence. Nevertheless it points the trend of the day.

2. Col. Jesse G. Vincent, president of the Society of Automotive Engineers, vice-president and chief engineer for the Packard Motor Car Co., and a leader in war-time aeronautic engine developments, pointed out along what lines development was needed.

3. R. E. M. Cowie, vice-president of the American Railway Express Co., announced a willingness of that company to contract for cargo space to an extent that would justify the organization of a $1,000,000 airplane traffic company. Following his talk at the Aero Show, Mr. Cowie made a direct statement of his position for AUTOMOTIVE INDUSTRIES.

There is an interesting point of contact between Colonel Vincent's suggestion and that of Mr. Cowie. Colonel Vincent's outline was the development that can be made by using airplanes for carrying mail. Unfortunately such use is not assured. The House of Representatives has dropped all appropriations for airplane mail. The Senate has included such appropriations. So this development is as uncertain as anything political. Mr. Cowie's proposal for the use of airplanes in carrying express contemplates a similar use, but the plan must be carried out by private investment. This might be unfortunate for investors for a time, but possibly would be better in the end for getting results.

Now we will reverse the order of the points made and take them up in more detail, beginning with Mr. Cowie's message to the aircraft industry:

"Let me first make my position clear. The American Railway Express does not own, and will not own, transportation facilities. It merely contracts with existing transportation and, through contracts, aids the development of better facilities. I am a believer in aircraft and my investigations in Europe lead me to say the day of the airplane is here.

"Whenever it can be demonstrated—and I believe the means are already available—that a regular and dependable service by airplane can be maintained between certain large commercial centers, like New York and Chicago, it is planned by the American Railway Express Co. to contract with such an airplane operating company for cargo space and to offer this novel service to the public as the next evolution in the transportation of express parcels."

In his statement to AUTOMOTIVE INDUSTRIES, Mr. Cowie revealed more of the demands of his company and outlined more clearly just what he had in mind. This was simply that the airplane must go to work, as has been necessary in the growth of other business and earn its "bread and butter" by performing a distinct service to the shippers of the country.

"What have we to-day?" he asked. "Not much more than planes that fly to Atlantic City. In Europe, there are companies maintaining regular service and carrying goods day by day. And what do we do here at home? We get up a marathon across the continent, use old and antiquated equipment, something like a dozen planes finish and eight or ten men are killed."

A Large Stock Company

Mr. Cowie has had the airplane development under consideration for two years. He is in touch with the developments in Europe as the American Express Co.—a component of the railway express company—acts as a general forwarding agent and utilizes space in some of the successful aerial lines there. He has talked with designers and builders and already has had several proposals. Mr. Handley Page, head of the English airplane firm, is now in America and has attempted negotiations with Mr. Cowie. The results of these, of course, cannot be forecasted.

But Mr. Cowie believes, as he has stated to builders, that the airplane companies of America should act either jointly or singly in forming a large transportation company, with a capital of not less than $1,000,000. Its first work would be a line between New York and Chicago, having stops at Syracuse and Cleveland, where the express would be trans-shipped just as it now is at division or similar railroad points. The initial equipment should not be less than six planes.

"We stand ready to contract at once with such a service," he said. "We will not institute the service because that is not our province. The express company does not own railroads and steamship lines but it contracts for their facilities and the business is handled in that manner. We will do exactly the same with an airplane company."

It may be said that the airplane builders of America are making their sales to-day to individual pilots who expect the bulk of their revenue will come from taking passengers into the air upon a charge of $1 a minute, thus "cashing in" on the curiosity of sportsmen and others of adventurous spirit. The show was a witness to such a plan, the majority of makers concentrating principally upon showy passenger planes, only two distinct freight machines having been displayed—one of which has not been off the ground. The Cowie plan, based upon his knowledge of railroading and transportation, is that this passenger business is of minor consideration and that the carriage of mail and express presents a larger field and dwarfs all other projects.

The express business would require a nine-hour run between New York and Chicago, with special rates of such magnitude that maintenance, operating and investment expenses could be met. The volume possible for such a service cannot be predicted, Mr. Cowie declared, but he is positive that American business will offer the freight and pay the costs—but the builders first must produce the planes and put them into operation. He amplified this by the following statement:

The Express Traffic

"It is my opinion that there is an unmistakable place for the airplane in connection with express service, the very essence of which is speed. To-day the express service, under a unified management, extends over every railroad in the United States, 285,000 miles, with 28,000 offices, with 135,000 people upon its payrolls, utilizing in its daily operations 3500 motor trucks and 17,500 horse-drawn vehicles, transacting a business of more than $300,000,000 a year.

"This immense traffic consists mainly of the valuable merchandise of the country, and is made up of approximately 1,000,000 shipments a day. Many of these packages are of extreme urgency in their nature, and it is the respectively lightweight, non-bulky packages of an unusually urgent character that will naturally seek the expedited service that is now made possible by the airplane. I am satisfied there are many such, but no man in advance can tell what the volume may ultimately be.

"Suffice it to say that it would be passing strange if out of more than a million packages a day a small percentage of them were not of sufficient urgency to justify the cost that would be necessary to transport them by the quickest means of transportation that may be available, and, as will readily be seen, an almost infinitesimal proportion of the volume of express traffic moving would form a substantial cargo for airplane transport. My belief is that such a service would very quickly create a patronage peculiar to itself."

Colonel Vincent approached the commercialization of the airplane through the medium of the government mails. Thus he spoke for those favoring government aid and subsidies, a plan that has received a severe setback by the recent action in refusing appropriations for the mail service. The proposals, however, remain before Congress and have not been settled. Mr. Vincent's speech was delivered at the aeronautical dinner of the S. A. E., held at New York the night of March 10. It follows:

The Aerial Mail

"We had expected to have Otto Praeger, Second Assistant Postmaster General, with us to-night but unfortunately sickness in his family prevented his coming. As you all know, Mr. Praeger has been closely associated with the development of our aerial mail and I am sure that his enforced absence at this meeting is a distinct loss as he would undoubtedly have been able to give us some very important facts and figures bearing on the cost of aerial transportation. In his absence, I am going to take the liberty of briefly discussing the possibilities of our aerial mail from an engineering and production point of view.

"My remarks will be based on the fact that what we are all after is to be reasonably well prepared in the air for possible emergencies. The question is, therefore, what is the best way to accomplish this result. It is obvious

that anything that will promote the use of airplanes and thereby develop the art and make airplanes available, will be along the right lines. It is also obvious that during the next few years, at least, such development must be brought about, to a large extent, under government direction and with government funds.

"Granting that this is so, it is up to the government to determine the best way to bring this development about. We all know that the best way to bring about a development is to have a real use for the article which is to be developed.

"The government has such a use for airplanes in the mail service. I believe that all will agree that our aerial mail service has been well handled, and that, considering the appropriations available, desirable results have been obtained.

"Why not go after this mail service in a wholehearted manner and bring about the development that will be bound to result, if the mail service is really taken seriously and properly extended throughout our country. Such a course of procedure would, in my opinion, bring about the following results:

Increased Reliability

"a—Airplanes of greatly increased reliability would be evolved because, in this service, planes must fly on schedule time and failures would, therefore, be brought forcibly to the proper authorities.

"b—Airplanes of greater cruising radius would be evolved, as in this service it is desirable to fly for long distances without landing.

"c—The cost of airplanes would be gradually brought down to a proper level because manufacturers would receive sufficient orders to enable tooling up.

"d—Economical, reliable aircraft engines would be developed for this service and, as the quantities required would permit of tooling up, it follows naturally that such engines would be obtainable on short notice at minimum cost. Contrary to popular opinion, these engines could be developed so that they would be equally good for the mail service and for military purposes. Such a development would be of paramount importance because it takes at least a year to develop an airplane engine and get it into production even under war-time pressure, while the airplane itself can be designed and gotten into production in less than one-third the time providing the engine to be used in it is a known quantity.

"e—Many improved instruments for airplanes would be developed, including such important ones as are required for night flying, flying in cloudy weather, etc.

The Pilot Personnel

"f—Instead of losing all the technical knowledge and expert artisans which were developed during the war, as is now rapidly taking place, such a program would gradually increase technical knowledge and develop craftsmen, so that in case of any emergency, material for a war-time aircraft organization would be immediately available.

"g—There would be a constant demand for good reliable pilots, with the result that we would always have a large number of good pilots in training, who would be immediately available in case of an emergency.

"h—Such a program, by keeping the aircraft industry alive, would promote the development of commercial aeronautics, which would, in turn, not only hasten development that would help the aerial mail service but, what is more important, would make available much added technical knowledge and manufacturing facilities for use in case of an emergency.

"i—Probably the most important move that is required in order to make the development of commercial aeronautics possible is to obtain a complete system of good landing fields throughout the country. Obviously, the government cannot be expected to build or maintain such fields, but the expansion of the aerial mail would, in my opinion, bring about the desired result. These landing fields would be provided by the cities to be served by the aerial mail and I can think of nothing that would stir up so much interest in commercial aeronautics as a system of landing fields throughout this country with mail planes going and coming regularly every day.

"j—In case of emergency, if such a program were in swing, we would have a great number of airplanes and pilots which could be made ready quickly to do very valuable service for the Army and to a certain extent, for the Navy. It is, of course, true that these planes would not be military machines but they could be so constructed—without interfering with their value as mail carriers—that with the addition of some armament which could be very quickly installed, they would be very good for observation, photographing and bombing work.

"k—Last, but not least, a program of this kind would result in the maximum amount of activity and development at the minimum cost to the government for the reasons as stated above, i. e., the government has a job to do and by using airplanes to do it, the revenue accruing from such operations would be applied toward cost of equipment and maintenance.

Experimental Work

"I understand experience to date indicates that the aerial mail service can be made, almost, if not entirely, self-supporting after being established. This should not be taken as too important a consideration as, in order to bring about the results desired, it will be important to have sufficient appropriations to keep experimental work constantly going on with the view of bettering equipment from month to month.

"I have given this matter considerable thought and the more I think about it the more I realize the possibilities of bringing about a wonderful development in aeronautics through the use of aerial mail as a vast proving organization. I feel sure that if such a program could be made a reality, there would be absolutely no question but what the United States would lead the world in aeronautics inside of a very few years.

"In closing, I would like to point out that, when we entered the recent war, the government had no trouble in obtaining prompt delivery of passenger cars and trucks simply because such vehicles had been thoroughly developed and were in quantity production for other uses. In my opinion the aerial mail offers a possibility of bringing about the same condition in aeronautics—firstly by making mail-carrying planes and pilots immediately available in case of emergency, and secondly, by bringing about the commercial use of airplanes which, in the final analysis, in my opinion, is the real answer."

The American airplane industry must fight for its place in business during the coming year. The financial future of some of the companies is not clear and how they will survive 1920 depends upon the efforts that will be made to keep them alive. Already a great deal has

been done and sturdy planes been perfected. But even so, much experimentation, much change and many improvements are necessary before the airplane will have become one of the great transportation machines of the United States. The military experience and construction form the ground work from which this structure will be built up.

"We have much work before us," one of the designers of a large engine building company said during the show. "But it is much less than what we already have undergone. We have the basic engine but we face its conversion into an engine that will meet the needs of a commercial plane."

This manufacturer would not estimate the possible life of his engine under any conditions but he did state that construction practice tended toward sturdier and heavier machines that would have greater durability and be easier and less costly to overhaul and repair. Another manufacturer said that he had operated engines in recent months for 400 hr. without an overhaul, whereas previously his field had had a standing rule for a complete overhaul after 55 hr. flying time.

"The life of a motor, properly overhauled, handled and cared for, may be set at 500 hr. before it has practically to be rebuilt or used as salvage," said a pilot who has had continued experience with one of the larger builders. "That is to say about 40,000 miles when used for cross-country trips. This estimate is with average mechanics, but, with first-class mechanics and good equipment in the shop and hangars, 1,000 hr. is not an excessive estimate."

However, any estimate of the airplane engine to-day can only be along broad lines and must be inconclusive. The same may be said of the propellers and the plane structure, except that the latter should be measured in months and not in flying time.

"The wings and tail surfaces of present-day machines should last from eight months to a year without being recovered," the same pilot said. "If properly built and varnished, they should stand being covered two or three times. It is only recently that dopes have been developed which do not deteriorate rapidly. Pigmented dopes have been brought to the point where they may be depended upon to hold the pigment and so shut out the actinic light, one of the worst enemies of the dope film.

"The fuselage should last for several years, particularly if of monocoque or semi-monocoque construction. The landing gear is usually injured long before it can be affected by wear. Tires are never worn out; they are 'pulled'—that is, burst or pulled out of the rim. The elastic cord used as a shock absorber will experience fatigue in time and must be rewrapped. This also is usually broken before it loses sufficient elasticity to be rendered useless. Thus it may be seen that the life of the landing gear depends chiefly on the skill of the pilot and the character of the landing field."

Along with the continuation of design and engineering improvement must go that relating to operations and personnel. Landing fields and facilities must be provided, fliers must be trained in commercial work and the instruments of direction finding, radio, telephone, and signaling, and warning signs and mapping must be kept up and got under way. Mr. Cowie expressed the belief that the Interstate Commerce Commission should exercise the same supervision over aircraft transportation that it does over that of the railroads. Others believe that a separate department of the Cabinet should undertake such supervision. All, however, are agreed that some agency should be provided, and that the quicker it comes the better it will be for the industry.

Whatever may be the outcome of the struggles of the airplane industry, now that the prop of war-time necessity has been knocked from under it, the New York exhibition made plain the statement that the aircraft must go to work. The day of the exhibition flier seems to have been ended, or to be approaching its death, and the carrying of curiosity-seekers is no more than a temporary expediency. The airplane must become an agency for the transportation of express, mails or passengers who seek not thrills but to be carried from one place to another.

European makers have begun this work. How will the Americans perform the same service?

Stopping Leaks in Fuel Tanks

DURING the war numerous experiments were made with the object of securing a means for easily and quickly closing rents in gasoline tanks, says *La Technique Moderne*. Toward the end of 1916 the testing laboratory of the *Conservatoire National des Arts et Metieres* was requested to analyze and test a special putty, called Ob. The analysis gave the following results:

		Per cent
Soaps	fatty acids	17.05
	alkalies	3.60
Glycerine		4.00
Water		21.45
Various mineral materials		53.90
		100.00

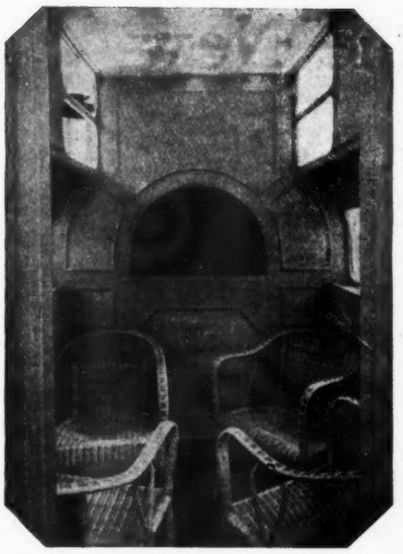
	Per cent
Clay	95.20
Lime	3.00
Magnesia	0.40
Sulphuric acid	1.40
	100.00

In order to determine how this putty behaved under the influence of vibration, a 40-gal. tank was mounted on a light motor truck. Nine holes were punched in it, varying in diameter from 0.4 to 0.8 in. and located at different heights. These holes were closed up by means of plugs made from the paste or putty under test.

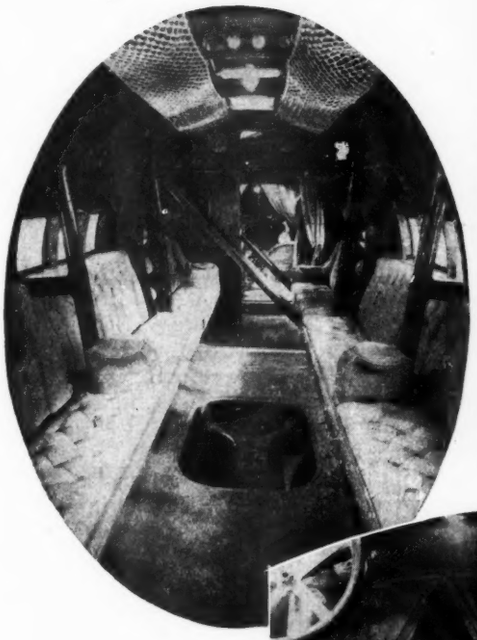
The truck was driven a distance of 34 miles over bad roads at an average speed of 13 m.p.h. A single crack formed in one of the plugs and this was stopped by applying more of the putty. After 23 hours of testing there was no oozing out of liquid at any of the plugs and the conclusion was reached that this putty or cement may render great services in stopping leaks in fuel tanks.

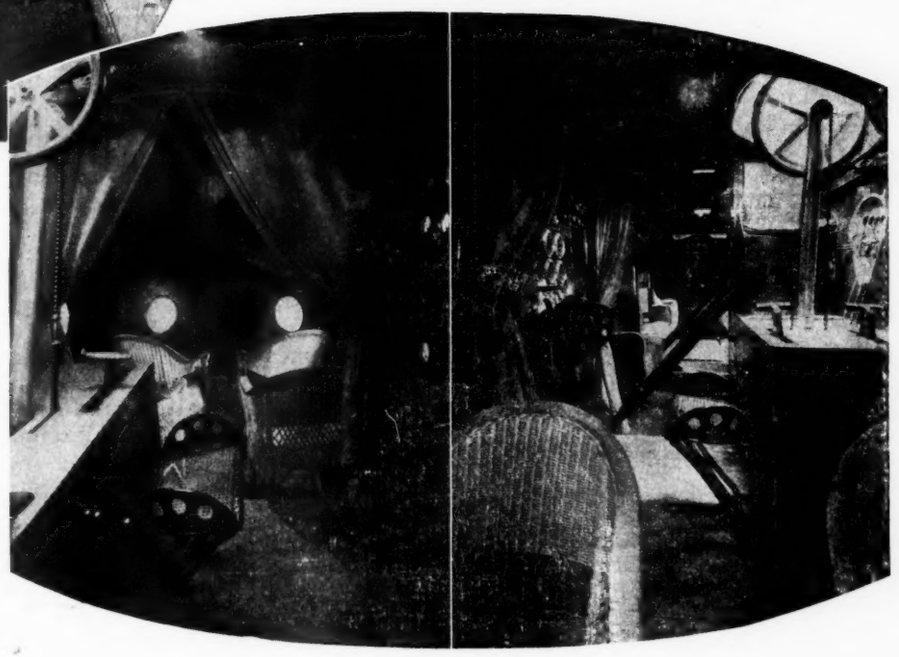
ACCORDING to a paper read by M. Martinot-Lagarde, before the Society of Civil Engineers of France, the production of aircraft engines in that country increased from 40 per month in August, 1914, to 4200 in October, 1918, or from 900 per year in 1914 to 34,000 for the first ten months of 1918. During the war a total of nearly 90,000 aircraft engines were built, representing an aggregate work of 100,000,000 man-hours, an output of nearly 20,000,00 hp. and a cost of 2,000,000,000 francs.

European Refinements of Passenger Carrying Airplanes



These photographs, which are self-explanatory, were taken at the recent Paris aircraft show, and evidence the strides that are being made to overtake the European commercial field





Several machines of leading make are represented here, this phase of development in Europe having been pushed much more than it has in America

Technical Features of the New Aircraft Models

Supplementing the article in last week's issue on the New York aircraft show, the one herewith gives an engineering description of some of the features of the new planes. Necessarily brief, the sketches, made by a staff artist, are a worth while addition as they indicate how the designers have met some of the construction problems

ACCESSORIES and instruments at the recent aircraft show at New York reflected the recent rapid development of aircraft. A particularly interesting series of banking indicators, turn indicators, air speed indicators, air distance recorders, etc., was shown by the Pioneer Instrument Co. The Pioneer air speed indicator is a striking example of how aircraft instruments may be simplified to advantage, both as regards reliability and cost of manufacture. This instrument consists of a simple pitot tube designed for mounting on wing struts or other convenient positions, which is connected by tubing to a glass tube indicator operated on the U gage principle and calibrated to read directly in miles per hour. This apparatus should be reliable when once calibrated, providing, of course, that it is properly mounted on the aircraft, where it will be free from air interferences.

With the exception of the Curtiss C-12, Wright-Hispano Model K, and L-W-F Cato, the engines shown are familiar to readers of AUTOMOTIVE INDUSTRIES. The Curtiss C-12 is a 12-cylinder, Vee type engine, resembling closely this company's K-12 engine. Details of the new model are not available. The Wright-Hispano Model K is a geared down Vee type with a 37 mm. gun mounted between the banks of the cylinders and arranged to shoot through the hollow propeller hub. This arrangement made necessary a considerable number of changes from the Wright-Hispano Model H. The L-W-F Cato is a two-cylinder opposed air-cooled engine designed specially for the L-W-F single seat "Butterfly."

Aeromarine Model 40 L.—This machine is a two-seater sport type without any radical features. The hull follows typical Aeromarine lines and the boat in general is finely finished, although not to the degree of refinement attained in this company's Model 50-B. Among the interesting details noted was the provision of pockets for books or papers in the backs of the seats. A transfer is applied to each instrument board cautioning the pilot not to operate his engine at wide open throttle where avoidable, and to fly over water in preference to over land where possible. The power plant consists of an Aeromarine L-6-D, also Curtiss OXX6 is given in the catalogue as optional equipment.

Curtiss Eagle.—This machine is similar to the three motored Curtiss Eagle exhibited at the Chicago show. The third engine installed in the fuselage nose of the original Eagle has been eliminated in this model, and the two K-6 wing engines have been replaced by C-12's, thus reducing the number of engine units, but increasing the total horsepower. The installation of the heavier engines on the wings made it necessary to move these units further forward. They are carried by bracing extending forward from the front wing struts. On the whole, the new arrangement makes a cleaner appearing job than the three engined model. There is no overlapping of propellor slip-streams, such as existed with the original arrangement, and the increased horsepower should give considerably better performance, while at the same time giving the pilot one less unit for attention.

The upholstery, which in the original model was whipcord, has been changed to gray leather, and toilet facilities have been provided at the rear end of the cabin. This is the first American airplane so equipped and serves to illustrate the refinement in aircraft. It is questionable, however, if such use will be permitted when aircraft operation is regulated by law.

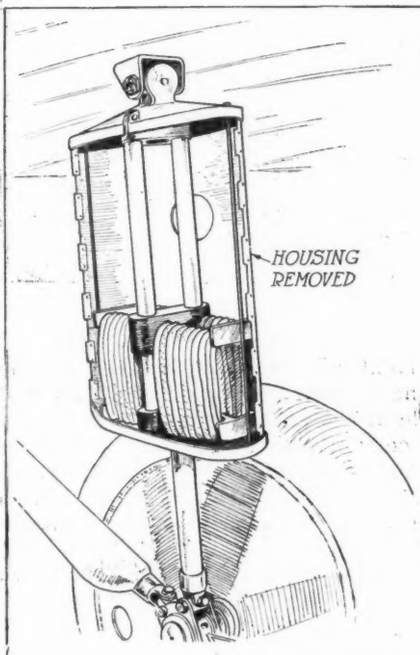
L-W-F Model L "Butterfly."—This machine was one of the most striking exhibits at the show. It is a small monoplane of 29 ft. 9 in. span and 19 ft. length, the total weight empty being given as 595 lb. The monocoque fuselage gave the machine an extremely fine appearance for a low-priced machine, it being listed at $2500 f. o. b., College Point, L. I. The elevators and rudders are interchangeable and bracing from control horns has been so worked out that a single wire in direct line with the operating wire is used, thus eliminating the second bracing wire usually found necessary on control horns. The entire machine is designed with a view to providing maximum interchangeability. Many of the wing struts and many wires throughout the machine are interchangeable. The design permits of rapid assembly, practically no adjustments being necessary in the field.

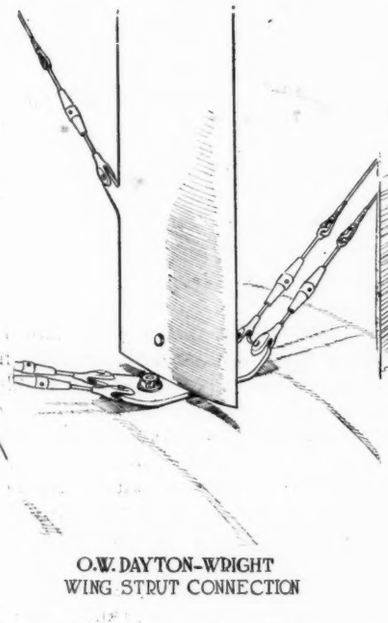
The power plant consists of a two-cylinder horizontally opposed engine of 5 in. bore by 6 in. stroke. The engine is also manufactured by the L-W-F company. It is mounted on two cast aluminum alloy brackets, which are in turn bolted to a plywood bracing plate fastened to the front end of the fuselage. The streamline housing covers the engine, with the exception of the cylinder cooling fins. The oil tank is mounted on the fuselage floor in the rear of the engine supporting plates, while the gasoline tank is mounted directly in the back of the instrument board. On the whole, this machine is a fine production proposition, and it would appear to be quite practicable to turn these machines out for list price of $2500 and still maintain a good standard of workmanship.

L-W-F Model H, Aerial Freighter or Mail Plane.—This machine, which towered above all of the others at the show, was designed for the aerial mail service to carry 3000 lb. mail on long flights or 6000 lb. on short flights. It has a wing span of 105 ft., gap of 11 ft., and a total area of 2200 sq. ft. The weight empty is 12,400 lb., or fully loaded approximately 20,000 lb. A biplane tail is carried by two monocoque fuselages of some 50 ft. overall length.

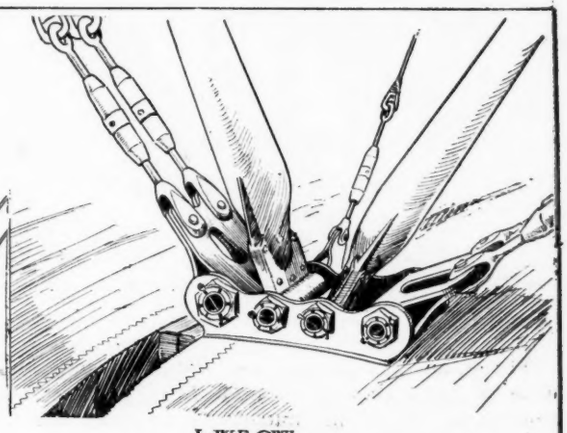
SIDE GUIDE AND GRIPPER

Technical Details of the American Planes

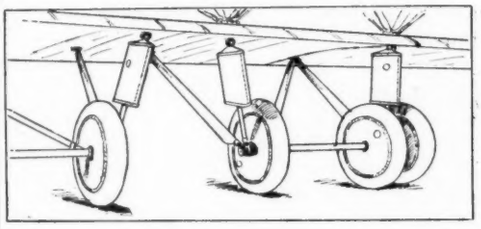




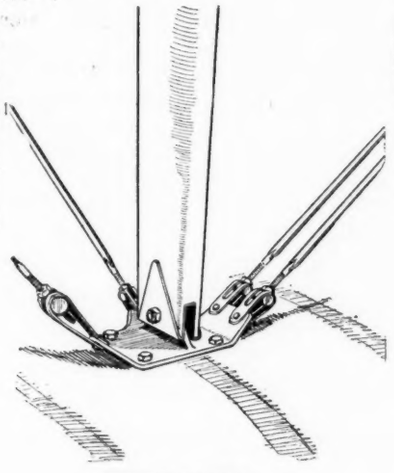
O.W. DAYTON-WRIGHT
WING STRUT CONNECTION



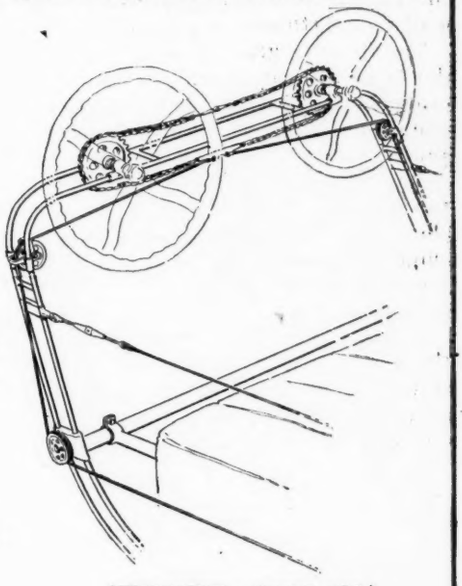
L-W-F OWL
LOWER ENGINE V-STRUT CONNECTION



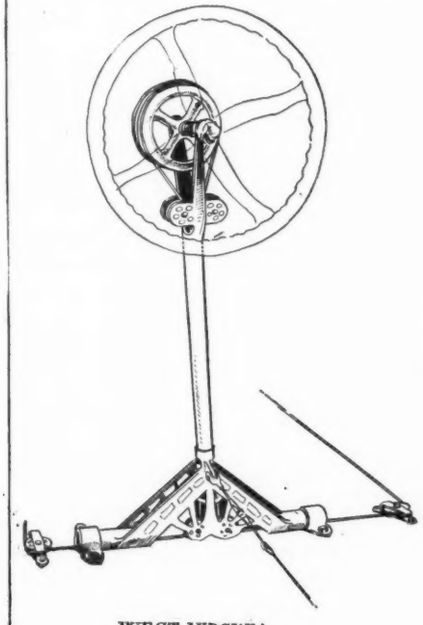
L-W-F OWL
ABOVE - DETAIL OF LANDING GEAR SHOCK ABSORBER MECHANISM.
BELOW - LANDING GEAR ARRANGEMENT.



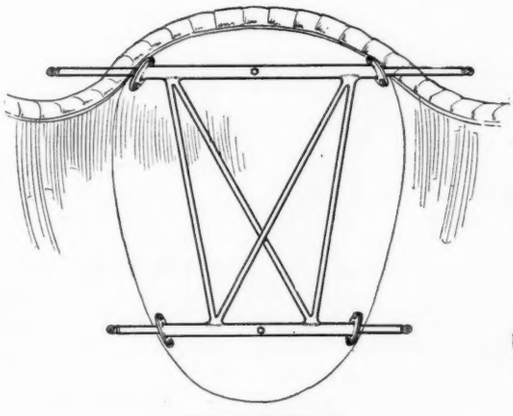
CURTISS EAGLE
WING STRUT CONNECTION



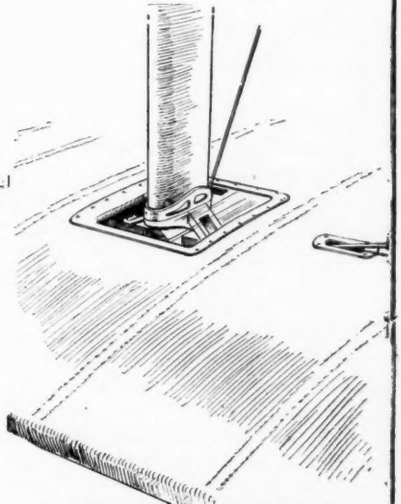
AEROMARINE - (MODEL 40L)
CONTROL BRIDGE



WEST VIRGINIA
CONTROL COLUMN



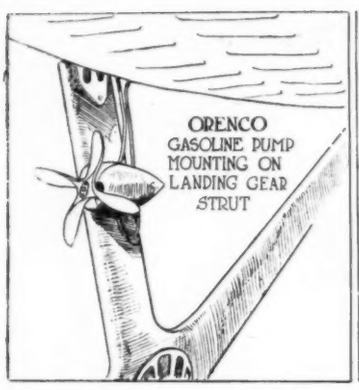
L-W-F BUTTERFLY
FUSILAGE BRACING FOR WING CONNECTION

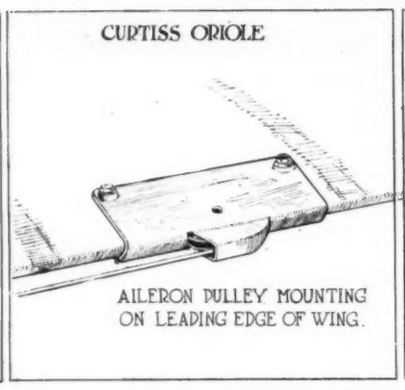


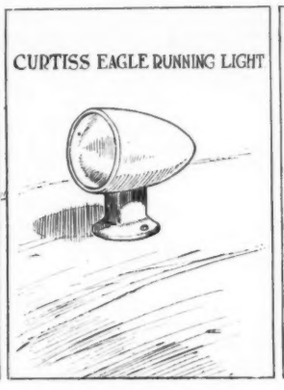
THOMAS-MORSE (MAIL PLANE)
WING STRUT CONNECTION.

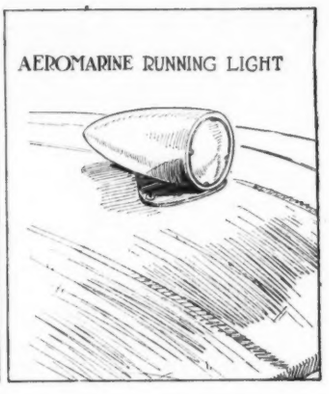
These sketches were made by a staff artist at the recent New York aircraft show

SIDE GUIDE AND GRIPPER









Other details featured at the New York aircraft show

Three Liberty-12 engines are provided, one in the nose of each fuselage and a third in the nose of the central nacelle. This nacelle also carries the main mail compartment. The pilot's cockpit, equipped with dual controls, is located in the rear of this nacelle. Auxiliary mail compartments are provided in each fuselage.

The landing gear is comparatively simple, considering the large weight to be carried. The shock absorber arrangement is strongly reminiscent of Handley Page practice and consists of a rubber shock absorber cord mechanism enclosed in a streamline housing.

On the whole the machine presents a good appearance and gives the impression of being thoroughly practicable. The fuselages impress one as being somewhat longer than necessary for the design, but this impression may be partially due to their small diameter in comparison to their length.

Orenco Type F 4-Seater Airplane.—This machine is characterized by a somewhat unusual seating arrangement, which should prove popular. Two cockpits are provided, each having a double seat, giving a total seating capacity of four. This arrangement would appear to be a move in the right direction, as tandem seating undoubtedly gives one a feeling of loneliness. While it is true that the rattle of the exhaust prevents conversation, this will most certainly be eliminated by the use of efficient mufflers, and it seems advisable for designers to take this into consideration, as the installation of a muffler can be made at any time without other alteration of a machine.

The Orenco type F is equipped with a Hispano-Suiza 8-cylinder, 150-hp. engine, and weighs empty 1477 lb., or fully loaded 2432 lb. The machine presents a clean cut appearance and no radical ideas have been incorporated, unless the seating arrangement may be so regarded. Another noteworthy feature which should appeal to sportsmen is the fact that the upper and lower wings are interchangeable.

Thomas-Morse Air Mail Plane.—In order to meet the requirements of the Post Office Department for mail planes, the Thomas-Morse company designed their Transcontinental Air Mail Plane, a machine of 45 ft. 6 in. span, 25 ft. 5 in. long, having a total wing area of 632 sq. ft., the weight empty being 2890 lb., and fully

TECHNICAL SPECIFICATIONS OF AIRPLANES

Exhibited at the New York Aircraft Show

(March 6 to 13, 1920)

Manufacturer and Model	General					Engines			Wing Data				Weights		Performance		
	Type	Use	Overall L'gth	Overall H'ght	Carrying Capacity	No.	Make	Total B.H.P.	Span	Chord	Gap	Total Wing Area	Empty	Full	High Speed	Low Speed	Climb
			Ft. In.	Ft. In.					Ft. In.	Ft. In.	Ft. In.	Sq. Ft.	Lbs.	Lbs.	M.P.H.	M.P.H.	
Aeromarine—40-L	PB Boat	S	28–11	12– 7	2	1	Aeromarine L-6	130	48– 6 37– 8	6– 3	6– 6	504	2,161	2,799	76.0	44.0	2400 ft. 10 min.
Aeromarine—50-B2	PB Boat	S	28–11	12– 7	3	1	Aeromarine B-8	150	48– 6 37– 8	6– 3	6– 6	504	2,286	3,276	75.0	45.0	2200 ft. 10 min.
Curtiss—2 Motored Eagle	TB Land	P	56– 7	12–11	10	2	Curtiss K-12	800	64– 4	.....	7– 9	.....	5,310*	8,890*	124.5*	56.0*	.....
Curtiss Oriole	TB Land	S	25– 0	9– 0	3	1	Curtiss K-6	150	36– 0	5– 0	.....	.....	1,564	2,354	96.0	51.0	3700 ft. 10 min.
Curtiss Seagull	PB Boat	S	28–10	11– 9	3	1	Curtiss K-6	150	49– 9	.....	.....	.....	1,957	2,726	76.5	48.5	3000 ft. 10 min.
Curtiss—JN-4D2	TB Land	S	27– 4	9–11	2	1	Curtiss OX-5	90	43– 7	.....	.....	.....	1,535	2,025	75.0	45.0	2000 ft. 10 min.
Curtiss Standard J-1	TB Land	S	26– 7	10–10	2	1	Curtiss OX-5	90	43–11	.....	.....	.....	1,448	2,025	68.0	37.0	2600 ft. 10 min.
Dayton-Wright OW	TB Land	S	28– 6	9– 0	3	1	Hispano-Suiza or Packard-8	180	46– 0	6– 6	5– 7	534	1,450	2,492	95.0*	35.0*	6000 ft. 10 min.
Dayton-Wright KT	TB Land	S	30– 2	11– 2	3	1	Liberty-12 or Packard-12	420	43– 7	5– 6	5–10	441	2,686	4,128	120.0	55.0	10,000 ft. 10 min.
L-W-F—L (Butterfly)	TM Land	S	19– 0	5–10	1	1	L-W-F Cato	72*	29– 9	7– 0	.....	187	595	978	72.0*	30.0*	*4800 ft. 10 min.
L-W-F—H (Owl)	TB Land	F or M	53– 9	17– 6	4 and 3000 lbs.	3	Liberty-12	1200	105– 0	11– 0	11– 0	2200	12,400	20,000	110.0*	55.0*	*6000 ft. 9 min.
Orenco F	TB Land	S or P	25–10	9– 0	4	1	Hispano-Suiza	150	38– 0	5– 0	5– 0	355	1,477	2,432	90.0	43.0	5000 ft. 9 min.
Thomas-Morse Mail plane	TPB Land	F or M	25– 5	11– 0	2 and 1500 lbs.	2	Hispano-Suiza	600	45– 6	8–10	6– 3	632	2,890	5,500	130.0	55.0	10,000 ft. 14 min.
West Virginia—C	TB Land	S	27– 0	9– 9	3	1	Hispano-Suiza	150	44– 5 34–10	6– 0	5– 1	435	1,700	2,400	77.0	40.0	4000 ft. 10 min.

KEY TO NOTATION:

F—Freighter.
M—Mail Carrier.
P—Passenger.
PB—Pusher Biplane.
S—Sport.
TB—Tractor Biplane.
TM—Tractor Monoplane.
TPB—Tractor-Pusher Biplane.

*Estimated by manufacturer.

SIDE GUIDE AND CRIBBED

TECHNICAL SPECIFICATIONS OF AIRCRAFT ENGINES

Exhibited at the New York Aircraft Show

(March 6-13, 1920)

Manufacturer	Model	Type	Cooling	Cylinders			Ignition	Carburetor	Oiling	Horsepower	Consumption in lbs. per B. H.P.-Hr.		Weight, Lbs.
				Number	Bore	Stroke					Gas.	Oil	
					in.	in.							
Aeromarine Plane & Motor Co.	B	90°-V.	Water	8	3.625	5.125	Two Dixie-800	Zenith	Pressure	148 at 1300	....	....	460
Aeromarine Plane & Motor Co.	L	Vert.	Water	6	4.250	6.500	Two Delco	Duplex Two	Pressure	166 at 1500 130 at 1625	0.53	0.03	375 405, with start. and gen.
Curtiss Aeroplane & Motor Corpn.	K-12	V	Water	12	4.500	6.000	Two H.T. Mag.	Two Duplex	Pressure	375 at 2250	0.55	0.03	728
Curtiss Aeroplane & Motor Corpn.	K-6	Vert.	Water	6	4.500	6.000	Two H.T. Mag.	Duplex	Pressure	150 at 1700	0.55	0.03	417
Curtiss Aeroplane & Motor Corpn.	OX-5	V	Water	8	4.000	5.000	H.T. Mag.	Duplex	Pressure	90 at 1400	0.50	0.03	390
Lawrance Aero Engine Corpn.	L-2	Static Radial	Air	3	4.250	5.250	Philbrin	Zenith Stromberg	Pressure	60 at 1800	....	....	140
L-W-F Engineering Company	Cato	Horis. Opposed	Air	2	5.000	6.000	Mag.	Zenith	....	72† at 1825	....	....	154
Packard Motor Car Co.	1-A-744	60°-V	Water	8	4.750	5.250	Double Delco	Zenith	Pressure	160 at 1525	....	....	585
Wright Aeronautical Corpn. (Wright-Hispano).	E	90°-V	Water	8	4.724	5.118	Two Dixie-800	Stromberg	Pressure	180	....	....	470
Wright Aeronautical Corpn. (Wright-Hispano).	H	90°-V	Water	8	5.511	5.905	Two Dixie-800	Stromberg	Pressure	300	....	....	620
*Wright Aeronantical Corpn. (Wright-Hispano).	K	90°-V	Water	8	5.511	5.905	Two Dixie-800	Stromberg	Pressure	300	....	....	791
Hall Scott Motor Co.	L-6	Vert.	Water	6	5.000	7.000	Delco	Miller or Zenith	Pressure	215 at 1700	0.50	0.03	495

*Geared, 1.44 to 1. Gun mounted to shoot through propeller hub.
†Estimated by manufacturer.

loaded 5500 lb. Two fuselages are provided, each fuselage carrying an independent tail. The control systems are connected at the forward part of the machine. Two 300 hp. Hispano-Suiza engines are installed in the center nacelle, which also carries a mail compartment. A single Albatross type of wing radiator is installed in the upper wing immediately above the nacelle and is provided with a deflector for regulating the flow of air.

Single cockpits are provided at the extreme front of each fuselage, the left hand cockpit carrying the pilot, while the right hand cockpit carries the mechanic. The pilot's controls are coupled directly, whereas the mechanic's controls are provided with flexible connections, enabling the pilot to take control from the mechanic at any time. This flexible connection is ingenious and is obtained by making the control stick in two parts, upper and lower, each part being provided at its end with a round flat plate. The stick is assembled by placing these plates face to face and lacing through both plates with rubber shock absorber cord, thus giving a flexible connection. This control system has been thoroughly tried in the air and has been found to be practicable and convenient.

West Virginia Type C Airplane.—The West Virginia Type C is a three-seater machine designed and based on the JN lines, in so far as the wings and some other parts are concerned. The provision of three seats, however, necessitated such radical changes that practically an entirely new fuselage and landing gear was found necessary. The double seat is located in the front and no controls are provided. The pilot is located in the rear seat and provided with a control of the center column type. The power plant consists of an 8-cylinder Hispano Suiza, 150-hp. engine. A honeycomb radiator of somewhat artistic appearance is installed on the fuselage nose between the engine and propeller. The cockpits are both unusually roomy, but the forward one is not over-convenient to get into or out of, although considerably improved over the original JN, from which the machine was evolved.

Aircraft Fusion in Great Britain

COMMERCIAL interest in Great Britain has been considerably aroused, says the American Chamber of Commerce in London, by the announcement of the amalgamation of the Aircraft Manufacturing Co. with the Birmingham Small Arms Co., Ltd.

The former firm, of which Holt Thomas is the founder, chairman and managing director, are the makers of the Airco airplanes, which are employed on the London-Paris air mail service. The B. S. A. includes a number of firms and represents various interests, its products including explosives, arms, bicycles, and motor cars. The identity of the Aircraft Manufacturing Co. will be maintained and the manufacture of Airco airplanes will be continued under the direction of Mr. Thomas.

There is a tendency to regard this fusion as indicating what is likely to happen in the British airplane industry generally, unless there is some immediate change in the situation. Airplane manufacturers are compelled, through lack of support, either to cease business altogether, or to produce airplanes merely as a side line. Commercial aviation in its present form does not offer strong inducements to business men. To make it attractive, it must be greatly expanded. The relation between overhead and running charges is still disproportionately and unnecessarily great.

War machines, converted for commercial flying, the American Chamber points out, at present can carry passengers from London to Paris at 100 m.p.h., at a rate of about 1/3d. a mile, while for goods transport the rate of 2/6d. per lb. for a small parcel can be reduced to 1/6d. for a consignment of 75 lb. and over. Owing to the speed, the time saved is enormous. A passenger picked up in London at 11 a.m. should reach Paris before 4 p.m. Parcels are delivered by air express well within a single day, and express letters travel between the two cities from door to door in about five hours. American business men on quick trips of investigation of British and continental markets have been heavy users of this service.

Some of the Changes in the New Engine Models

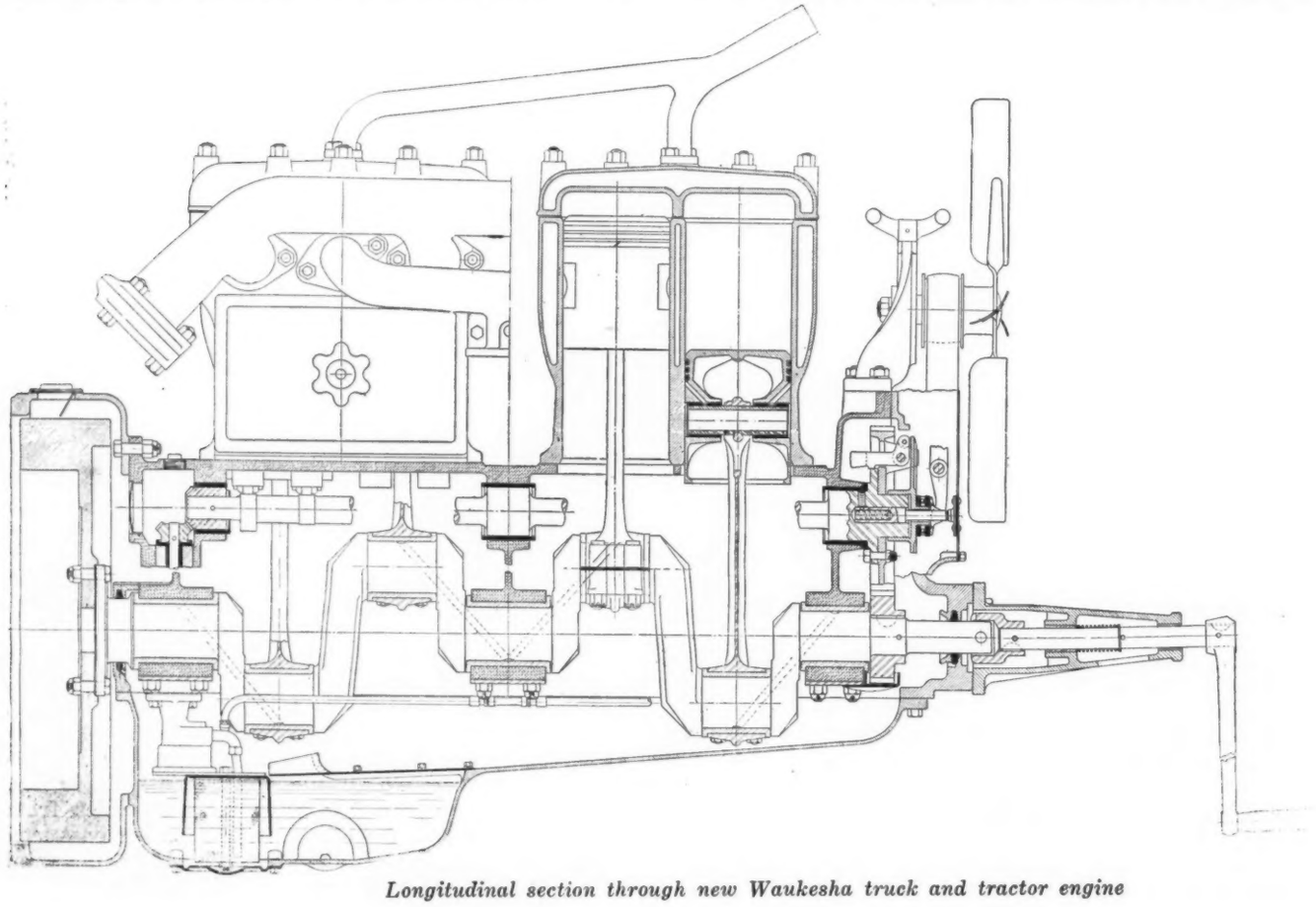
In the design of new engine types, the Waukesha Motor Co. has made allowance for the tendency toward fuel changes. The demands for pneumatic-tired trucks and higher speed engines also are taken into account. This requires stout crankcases and crankshafts and large bearing surfaces.

By J. Edward Schipper

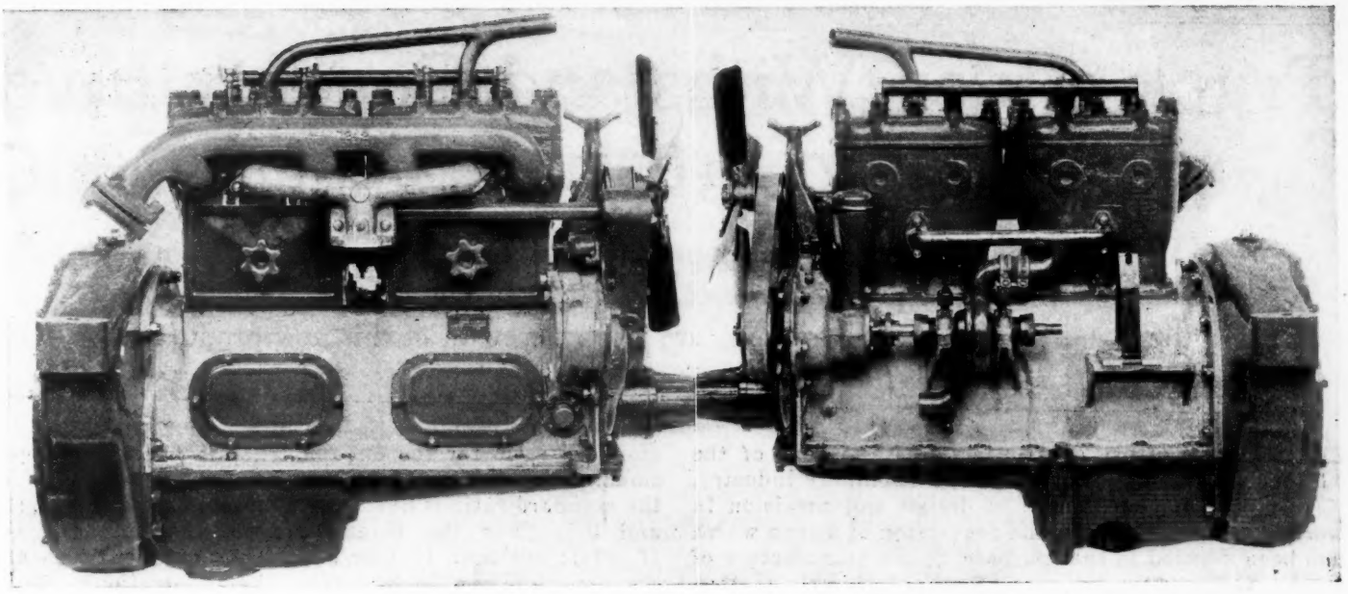
IN preparing for the production of a new line of engines, the Waukesha Motor Co. has proceeded on the assumption that 1925 fuels will have reached an end-point of 500 deg. Fahr., and has provided a larger piston displacement per horsepower output desired, to allow for the greater expansion of the charge. It is recognized that an allowance must be made for the loss in weight of charge by preheating the mixture, and also for the loss due to the lower compression imposed by the detonation tendencies of these higher end-point fuels. To maintain the same power at given speeds, the displacement of these engines has been made 11 per cent greater than that of the previous engines.

In order to take care of the demand for pneumatic-tired trucks, higher engine speeds will be necessary, and in order to provide for this, stiff crankcases, crankshafts, and larger bearings are used. The connecting-rod bearings are located centrally in the pistons. Because smaller engines can be run at higher speeds, due to better cooling, and, since the crankshaft in this case must be relatively larger, the same diameter of crank is used in all engines from 289 cu. in. up to 492 cu. in. displacement. On all these engines the camshaft holes are of the same size, so that service reamers can be used on the main rods and camshaft bearings.

This series of engines has the L-head cylinders, cast in pairs with detachable head. They carry long iron pistons with three rings, all mounted near the top of the piston. The piston boss is a trifle below the center of the piston and the web above the boss is drilled for an oil lead to the



Longitudinal section through new Waukesha truck and tractor engine

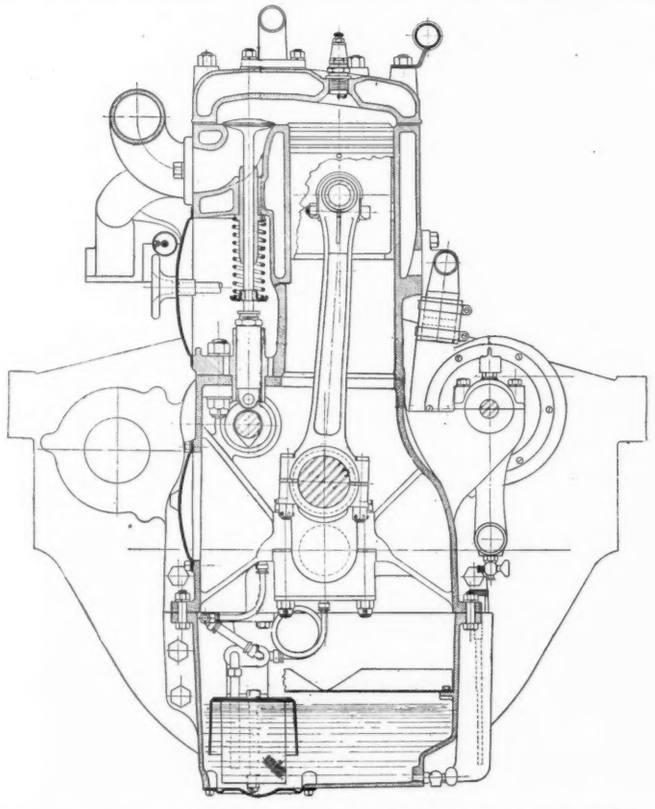


Right side of new Waukesha truck and tractor engine

Left side of the U type Waukesha engine

piston pin bushing from below the lowest ring. Thus the excess lubricant which is scraped off the cylinder walls is carried back to the upper side of the piston pin. The connecting rods are made of 0.35 per cent carbon steel, heat-treated, with the large end ground to fit the bearings. The bottom of the rod is designed to distribute the load to the center of the rod bearings for equal distribution.

The main and connecting-rod bearings have reinforced backs and are lined with Fahrig metal. The crankshaft is of chrome nickel steel, heat-treated. The valve push rods are 1⅛ in. in diameter and are hollow, case hardened and ground. They are of the roller type, with lock nut adjustment. The valves are of special alloy steel with split washers and are of the tapered type with a flat, case-hardened end.



Transverse section through new Waukesha truck and tractor engine

Lubrication is by pressure feed to all of the main and connecting-rod bearings. The oil is circulated by a gear pump located in a sump in the bottom of the oil pan. The oil pump is removable from the exterior. Any standard make of magneto can be used on this engine. The detailed specifications of the different models are given in the table herewith:

Specifications	Model CU	Model DU	Model EU	Model FU
Bore	4⅜	4½	5	4
Stroke	5¾	6¼	6¼	5¾
Displacement	346 cu.in.	398 cu.in.	491 cu.in.	389 cu.in.
Valve diameter, clear.	2	2⅛	2⅛	2
Connecting rod bearing.	2⅜x2½	2⅜x2¾	2⅜x3¼	2⅜x2½
Front main bearing	2⅜x2½	2⅜x2¾	2⅜x3¼	2⅜x2½
Center main bearing.	2½x3¼	2½x3½	2½x4	2½x3¼
Rear main bearing	2½x3¼	2½x3½	2½x4	2½x3¼
Piston pin bearing	1¼x2½	1⅜x2¼	1⅜x2½	1¼x2¼
Connecting rod length.	12¼	13¼	13¼	12¼
Camshaft diameter	1¼	1¼	1¼	1¼
Timing gears, helical pitch	8	8	8	8
Timing gears, face	1⅛	1⅛	1⅛	1⅛
Piston rings, No.	3	3	3	3
Piston rings, width	¼	¼	¼	¼
Spark plugs, S. A. E.	⅞x18	⅞x18	⅞x18	⅞x18
Carbureter flange, S. A. E.	1¼	1½	1½	1¼
Exhaust manifold, bore.	2.505	2.505	2.505	2.505
Flywheel diameter	17½	20	20	17½
Flywheel housing, S. A. E.	2	1	1	2
Fan diameter	20	20	20	20
Water inlet, diameter.	1½	1½	1½	1½
Water outlet, diameter.	1½	1½	1½	1½
Weight	840	910	980	825

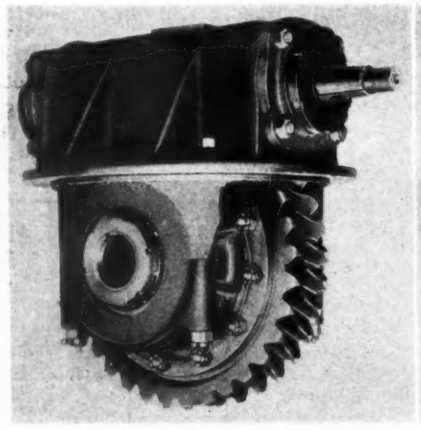
FIGURES in possession of the French Aviation Ministry show that between the months of May and November, 1919, three air routes were established and operated, apart from irregular flights. These were between Paris and London, Paris and Lille, and Toulouse and Rabat, Morocco. It was announced that the Under Secretary for Aviation is planning a wide network of air routes across France and to the African colonies, as well as to England, Spain and Italy.

Truck Axles Withstand Seventy-Five Tons in Pressure Test

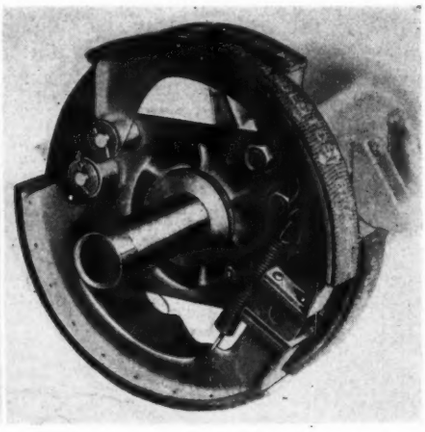
A new worm-driven axle is being produced in a factory, converted from the manufacture of printing presses, in sizes from 1 to 5 tons. Details of the type, as well as illustrations, are given herewith of this new product which should interest the automotive industry.

THE manufacture of printing presses is one of the most exacting branches of the machinery industry, calling for great care in design and precision in workmanship. Therefore, the conversion of a shop which has been devoted to that purpose, to the manufacture of truck axles should be a comparatively simple matter. Such a conversion has been made by the John Thompson Press Co., which has begun the manufacture of worm-driven truck axles in sizes from 1 to 5 tons.

The housing for the new axle is a one-piece malleable casting, reinforced with longitudinal ribs placed for maximum strength and minimum weight. Strength tests made with hydraulic pressure are said to have shown that from 60 to 75 tons' pressure is required to spring the two-ton housing ½ in. when supported on the spring pads, the force being applied at the center of the housing.



Worm assembly



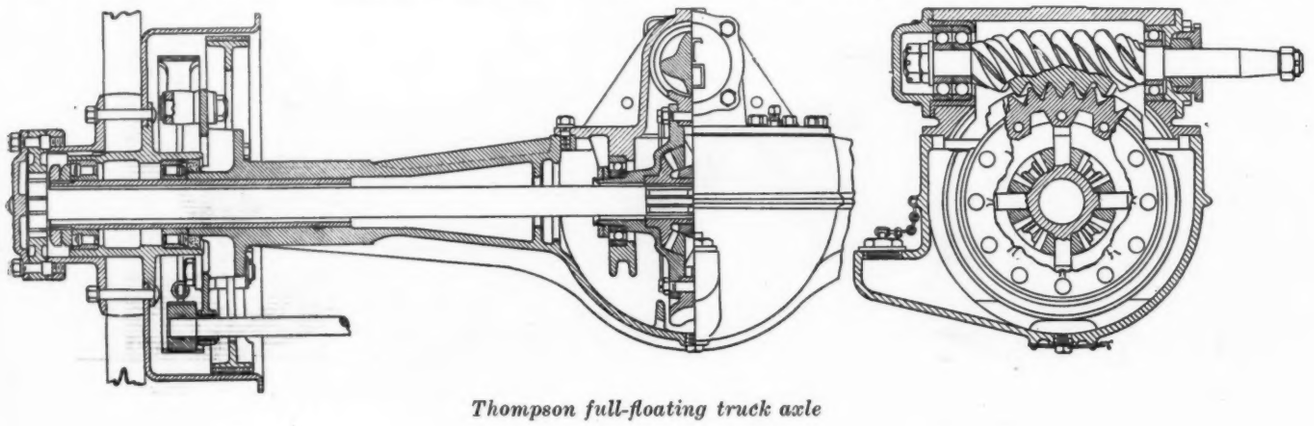
Brake assembly

The differential housing is a complete assembly, a self-contained unit carrying the worm, worm gear and differential gears. Ball bearings are used for both worm and differential. The structure is readily removed for examination or change of gears and is attached to the main housing by studs and nuts.

Chrome nickel steel is used for the worm, which is of the straight type, heat treated and ground. The standard ratio for the one-ton truck is 6¾:1, with optional ratios of 7¾:1 and 8¾:1. For the two-ton trucks the standard ratio is 8¼:1, with optional ratios of 7¾:1 and 9:1. For the three-ton type, the standard is 10 1/3:1; optional, 12:1 or 8¾:1. An excellent idea of the assembly can be had from the illustrations. The worm wheel is of a special bronze having a tensile strength of 60,000 lb. per sq. in.

On the one-ton truck each wheel is mounted on two single row bearings. Each bearing has a radial load capacity of 4900 lb. at 100 r.p.m., making the total load capacity for the four wheels 19,600 lb. On the two-ton truck there are two double row ball bearings, with a combined capacity of 7900 lb., or a total of 31,680 lb. for the four wheels. The 3½-ton truck has two single row ball bearings for each wheel. Each front wheel has a bearing capacity of 13,920 lb., and each rear wheel 15,800 lb., giving a total radial load capacity of 59,440 lb. A feature of the wheel mounting is the fact that the outer wheel flange is keyed to the hub, thus reducing strain on bolts.

The drive shaft is a one-piece forging, one end of which is splined to fit into the differential bevel gear. The outer end fits into the driving nut, which is securely bolted to the hub flange. The shaft is full-floating type.



Thompson full-floating truck axle

Foundry Turnover and Production Difficulties Met by Better Conditions

High labor turnover and unsatisfactory production in the foundry are almost universal in the automotive industry. Many executives see the coming summer as a period of crisis in the output of such material. The experience of several firms in successfully meeting the difficulties, given here, points a possible solution of the problem

A CHART compiled recently by the American Malleable Castings Association shows distinctly the difficulties in getting satisfactory foundry production at the present time. The chart indicates that, with the exception of the actual war period, the foundries have been unable to maintain their potential capacity production and that they are operating even farther below that limit than before the war.

Interpreting the results shown by the chart, the association is authority for the statement that foundry capacity is ample to provide for all the known demand, if shop and molding capacity were the only considerations. "The whole trouble," the statement sets forth, "is due to the scarcity of labor. . . ."

This view is borne out by the statement of the purchasing agent of a large Detroit automotive concern. He said: "It is almost impossible to get and hold men for work in the foundry. The older men in the trade are dying off and the young fellows are learning different trades where the work is easier and more pleasant. Next summer looks like a crisis; there seems to be no remedy for the situation."

A review of the labor turnover in automotive foundries reveals an excessive number of "quits," while absenteeism prevails more largely than in any other part of the factory. The experience of one Pennsylvania engine plant during January is typical of automotive plants that operate foundries. This plant employs approximately 1500 men, about

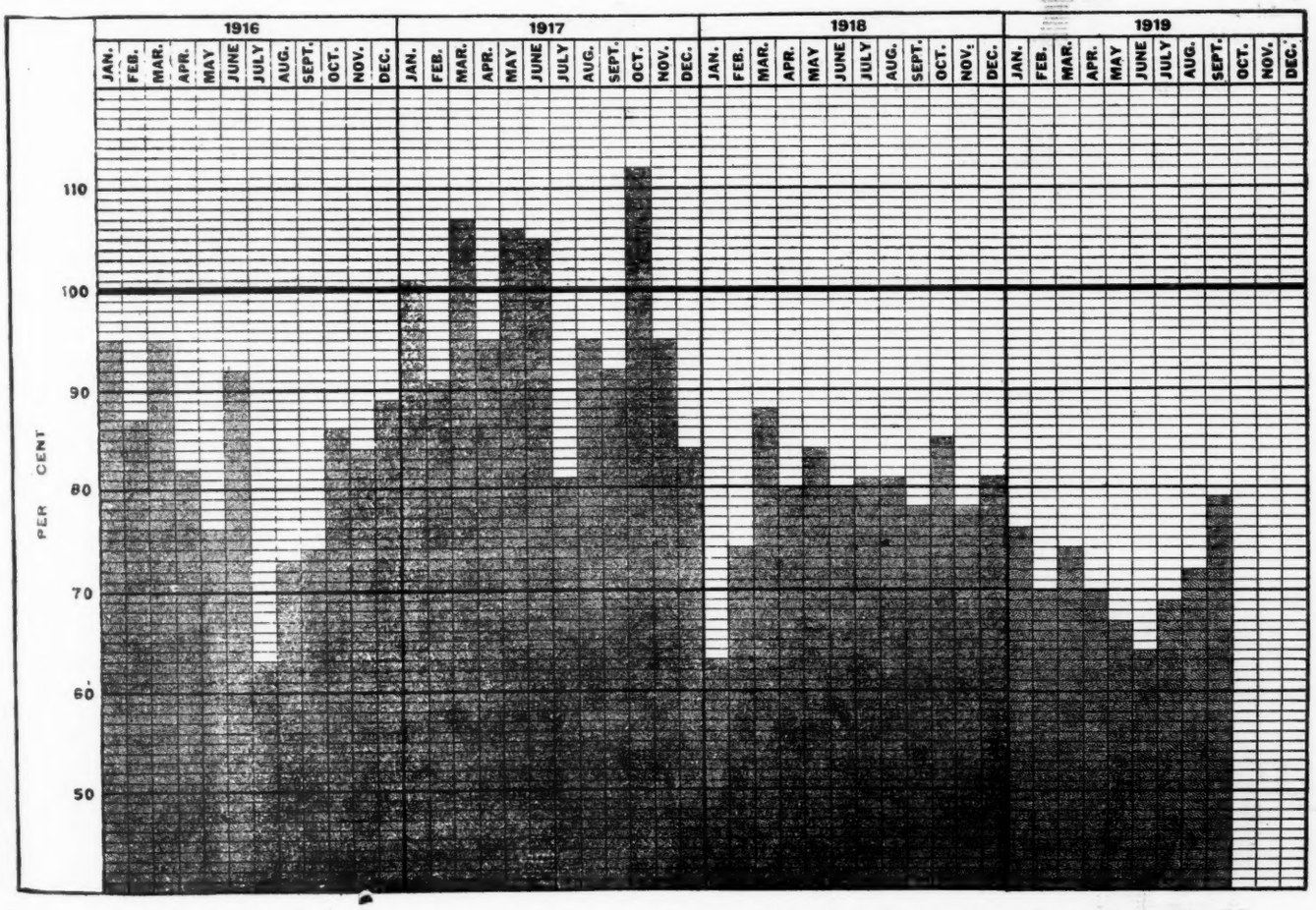


Chart showing shipments of castings by members of the American Malleable Castings Association. The shaded portion indicates shipments by months in relation to capacity

400 of whom constitute the foundry force. The total separations from this plant in January were 172, a turnover of about 12 per cent for the month. Out of this number, however, 86—half of the total separations—occurred from the foundry force. In other words, the foundry turnover was about 21.5 per cent, as against 7.8 per cent for the remainder of the plant. A large Detroit automobile factory recorded a similar experience last year, the average foundry turnover having been double the average plant turnover.

Thus, from the manufacturers' point of view, labor is the vital spot in the problems of foundry production and turnover. That these two factors are not operating in a satisfactory manner is attested by many employment managers and foundry superintendents. The unsatisfactory conditions are making themselves felt in a limited supply of castings and kindred inconveniences, yet definite attempts to investigate and remedy the difficulty are comparatively "few and far between."

The above facts granted, it is necessary to analyze the difficulties in detail to find possible remedies. One general statement may safely be made: Working conditions in the average foundry are far less pleasant and the work is usually more arduous than in any other part of the plant, with the possible exception of the forge shop. This being true, a careful study should indicate the chief causes of these unfavorable conditions, so that many of them may be eliminated. Certain practical experiments, as well as common sense, indicate that labor turnover can be greatly reduced and production effectually increased by making the foundry as pleasant a place in which to work as the machine shop or tool room.

Unfavorable Foundry Conditions

An investigation made several years ago of the factories of New York State revealed some interesting evidence concerning foundry conditions and foundry practices that tend to make the turnover excessive in that portion of the factory.

In testifying before the New York Factory Investigating Commission, an Irish molder summed up the general conditions in foundries vividly and with characteristic Irish keenness. "The conditions," he said, "in some of the shops is very poor, and in others, not so good." While the statement is not an intellectual analysis of the cause of foundry labor trouble, it does express a reaction on the part of the workman which must be taken definitely into consideration in seeking a solution to the difficulty.

Such a general statement, however, will not suffice. Definite conditions must be studied and definite remedies sought. Some of the chief specific objections to ordinary foundry conditions are included in the following list. Some already have been eliminated in certain plants, but the majority of foundries still contain enough of them to cause a high turnover and a curtailed production.

1. Dust, arising from shaking out castings, mixing up sand, etc., fills the lungs of workers and makes them liable to pulmonary diseases of various kinds.

2. Steam, arising from mold, often obscures light and makes accidents easy.

3. Gases, arising from cores, have ill effect upon lungs, eyes and general health of workers.

4. Chips from chipping castings fly some distance and endanger molders and other workers when this operation is performed in the same room with other portions of the foundry work.

5. The light is obscured and the air defiled by fumes from open wood and charcoal fires.

6. Drafts and poor ventilation in general.

7. Narrow obstructed passageways.

8. Inadequate or unclean toilet facilities.

None of these conditions is, of course, unfamiliar to the foundry owner, but the important relation which they bear to actual production and turnover seem to be less apparent. Were this relationship sufficiently recognized, it is hardly probable that so many of them would still be found in the average foundry. This is particularly true, since there is some remedy for practically every unfavorable foundry condition—not a theoretical, abstract remedy, but a practicable, workable remedy, which has been tried and proved. The Commissioner of the National Association of Founders said to the New York Commission a few years ago:

> **"I have been devoting considerable time in endeavoring to bring about better working conditions that go far beyond anything suggested in these measures. It is a business proposition, cutting out the philanthropy and all that sort of thing."**

The results to the individual workman of bad conditions are, in a general way, such as to hinder the young man of to-day from entering this trade, if he can make good on work of another sort. Industrial insurance mortality statistics, for instance, show an excessive mortality rate from consumption among foundry workers, this becoming marked between the ages of twenty-five and thirty-four. Other personal disadvantages accrue to the foundry worker which he can avoid by working elsewhere and, as a result, many foundry workers are doing just that thing.

The objectionable conditions enumerated do not, of course, cover the whole field, and the suggestion and application of practical remedies is the work of an expert in production and foundry practice. Some plants, however, have eliminated the chief unfavorable conditions in their foundries and have thereby achieved results worthy of notice.

A Practical Example of Improvement

The foundry of the Bullard Machine Tool Co. affords an excellent example of what may be done in a practical way toward bettering conditions and increasing production.

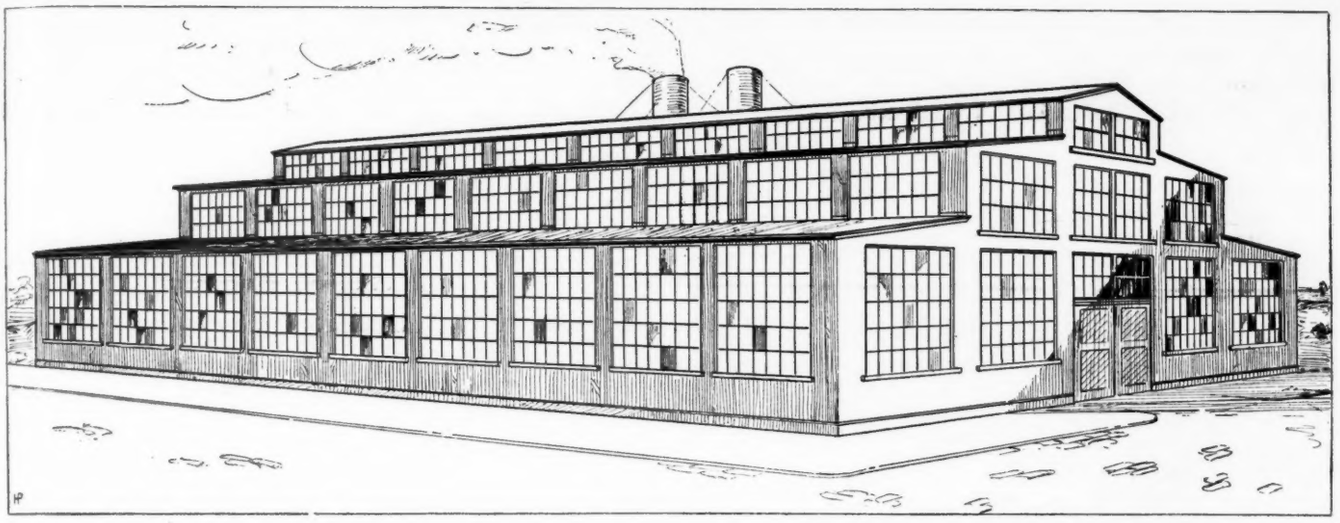
The construction of the foundry building is the greatest asset to improved working conditions. The walls of the structure are chiefly of glass, glazed over with white paint, eight or ten feet from the ground. Thus the interior is well lighted, while the direct sun rays are broken.

The type of roof construction not only aids in lighting, but admits of excellent ventilation without either causing drafts or making forced ventilation of any kind necessary. The windows at the side can be opened in sections, as can those at the top of the building. This natural ventilation is regulated in such a way that smoke and gases are almost immediately carried off, leaving the air for breathing clean and fresh.

Even in the afternoon, when most of the molds are poured, the air is clear and pleasant to breathe. Moreover, the ventilation is so good and the light so ample that it is possible to see clearly from end to end of the building at any time of the day.

The work of sand-blasting and chipping castings is carried on in a separate building adjacent to the main foundry, thus eliminating from the foundry proper one source of excessive dust and dirt. The sand-blast machine is operated in an enclosed booth, the operator entering the booth with his goggles, helmet, etc., and cleaning the castings. The sand is confined in the compartment and does not circulate about the rest of the shop.

All heavy work of any kind is handled in the foundry proper by means of cranes, so that a minimum of labor



Type of foundry building in use at Bullard Machine Tool Co. Natural light and ventilation are obtained to the fullest extent. High production per man has been obtained

is necessary. Ample space for moving about is provided, with the result that the accident record is lower than the average.

Clean toilets and washing facilities, as well as shower baths, are provided for the men. The cleanliness of the toilet facilities make them attractive. The wash basins are more popular than the shower baths and a greater number are provided. This is likely to be true in most foundries, as a man will be desirous of getting home as soon after his work as possible.

Each worker is provided with an individual locker and most of the men change their clothes before leaving.

Adjacent to the main foundry building is a smaller section in which small castings are made by means of green-sand molding. Originally constructed for a machine shop, the building has a much lower roof than the main foundry. It is an excellent example of what can be done, however, in adapting a building to foundry purposes. One large fan at the end of the room operates a number of forced drafts that quickly carry off the gases as they arise from the cores and molds. The atmosphere is thus kept nearly as clean and clear as in the main building.

Possibilities of a New Foundry

The Lycoming Foundry & Machinery Co. is another firm which has caught a practical vision of the production possibilities of a well-equipped foundry. The equipment includes clean toilet facilities and individual lockers, as well as comparatively good lighting facilities for the work. A new foundry is to be built, however, that will comprise both modern high-speed production methods and up-to-date building construction and working conditions.

One of the distinctive features of the new foundry will be a separate room for the cooling of cores. It will be effectually separated from the rest of the foundry and will be equipped with a special ventilation system for carrying off the gases.

This device will eliminate a particularly unpleasant condition of the ordinary foundry. Since this plant produces only engine parts, the new plant will be put on a production basis, conveyors, etc., eliminating practically all hand work.

The building planned for the new foundry will be somewhat similar to that of the Bullard plant, embodying the features for light and ventilation already described.

The foundry turnover at Bullard is estimated at something like 10 per cent monthly, which is exceptionally low when compared to that of the average foundry—particularly those of the automotive industry. This turnover is occurring almost entirely among the common labor; for molders and core-makers it averages less than 4 per cent. In addition to this comparatively low turnover, production has progressed exceptionally well. It is estimated that the average foundry is able to produce between 800 and 960 lb. of castings per molder, per week. The Bullard foundry recently reached a peak of 1560 lb. per molder, per week, while the production during the past year has varied between 1100 and 1500 lb.

There are other firms which have found it practicable to make their foundries as congenial a working place as any other portion of the factory. Their success in reducing turnover is especially significant at a time when the manufacturer is casting about for means of increasing his output and stabilizing his working force. A study of conditions and possible remedies may reveal possibilities for improvement, even where a new modern building might seem, at first glance, to be the only solution of the problems involved.

In making its recommendations, the New York Committee wrote: "All reasonable measures calculated to promote greater safety and health for employees in foundries should not only be insisted upon by the State, but should be welcomed by the foundry owners themselves."

In many States the laws regarding foundries, if lived up to in every particular by the manufacturer, would increase production for him; yet it is an unfortunate fact that such laws are too frequently disregarded or loosely enforced.

Girls Successful Crane Operators

WOMEN have been found superior to men as operators of inside shop cranes in the experience of the Bullard Machine Tool Company. Girls were first employed on this job during war times and their services were satisfactory. After the signing of the armistice, however, the girls were replaced by men.

In a short time, the workmen who loaded and unloaded the cranes protested, stating that the girls were far more accurate in stopping the cranes at the proper place and in lowering the materials accurately. They even threatened to quit work if the girls were not again placed on the cranes. Consequently, the girls were employed again and are now operating the cranes.

Glass Makers See Shortage Continued Until Next Year

Few phases of automotive production are of more import today than that concerning materials. Consequently, the statement and comment herewith were obtained by this publication so that the industry might have a concrete prediction as to the future course of the supply. Glass is an important material and its lack has hampered a large measure of output.

AN ample supply of glass for use in the building of closed bodies for the automotive trade probably will not be available until the early part of next year. A statement to this effect has been made to AUTOMOTIVE INDUSTRIES by Charles W. Brown, the president of the Pittsburgh Plate Glass Co. As this company manufactures approximately 60 per cent of the supply, the statement which follows is of unusual interest at this time, as it sets forth what may be expected in this phase of the materials market.

"In the spring of 1919 it was generally supposed that we were approaching an era of declining prices in the glass industry. Jobbers, mirror manufacturers, and, to some extent, the buyers of glass for automobiles, all felt that a reduction in price was likely and the manufacturers, finding it very difficult to sell their product, generally curtailed production rather than to put glass in stock on a basis of what seemed to be a high cost. Accordingly, manufacturers, jobbers and users of glass reduced their stocks to a minimum.

"Early last summer a decided change occurred. Apparently the trend of wages and costs was upward and a very unusual demand developed for automobiles, particularly for closed bodies. The furniture business was exceedingly good, and quite a demand developed for glass for mirror purposes.

"It was evident for the last six months of 1919 and the first part of 1920 that the demand for plate glass for automobile purposes was going to be much larger than ever before.

"Recognizing the situation, our company is now expending between $8,000,000 and $10,000,000 to increase the production of plate glass, but it will take some time to erect factories and perfect an organization. However, unless something unusual occurs, the plate glass manufacturers expect to be able to supply the demand for automobile purposes by the first part of next year. Many of the other manufacturers are also increasing their capacity materially.

"Incidentally, I might say that this is practically the first time for thirty years that the demand for plate glass has exceeded the supply and this condition is only temporary.

"Obviously, you are familiar with the interruptions of production of plate glass on account of the coal strike and difficulties in securing labor and transportation, all of which have had some effect on decreasing the supply of plate glass."

Furthering this statement, so far as it reveals the extent of the present shortage, was the recent announcement by one of the large commercial agencies in its weekly report that several established lines of furniture were being eliminated, at least for the time being, because the automobile body builders had outbid the furniture men for the glass they needed. Therein is given a graphic illustration of the glass situation.

The shortage of glass for closed body construction became known to the trade at large during the coal strike, when body-building plants were forced to close because of a shortage of glass. This was the first serious weakness to develop in the materials market.

The situation, however, was not a surprise for the larger companies. They knew that the crash was coming. As evidence of this knowledge can be cited large display advertisements run in British newspapers early last fall, seeking stocks of glass for export to America. One British representative of an American automobile company spent more than $2000 in such advertising. The only response he received was inquiries for any material he might uncover in addition to his own needs, and he did not obtain any glass for shipment out of England.

Since that time some of the larger body companies have fortified themselves for the future by buying glass plants. This step is regarded with favor by the smaller concerns. One of these builders said to AUTOMOTIVE INDUSTRIES: "I think this will help us. General Motors, for instance, probably will develop this source of supply sufficiently to care for their needs and leave the Pittsburgh supply for the rest of us."

ANNOUNCED from New York that the American Manufacturers' Association has adopted resolutions warning members against impending trade relations with Russia under the Soviet Government. The resolutions emphasize that direct trade with Russia would be virtually impossible except under supervision and control of the Soviet Government, and in any event would be small in volume, due to the demoralization of the Russian transportation system and the fact that business transactions for some time must be on a barter basis.

THE Canadian Bureau of Statistics has issued in detail a final estimate of the yield and value of the principal field crops of Canada for the season of 1919, as compared with 1918. The total yield of wheat from all Canada in 1919 was returned as 193,260,400 bushels from 19,125,968 sown acres, an average yield of better than 10 bushels per acre.

Improved Method of Machining Pistons Lowers Costs

By the method outlined here it is endeavored to obtain a product of the highest grade at low labor cost. Particular attention is given to simplicity of tooling, and the performance of work automatically whenever possible.

THE subject of machining pistons is important, both from engineering and economic considerations, and hence the attempts at improving the methods. In the present process each operation is described separately.

First Operation.—The casting as it comes from the foundry is set over a centering mandrel in the sensitive drill press and center-drilled true with the rough core, the drill being guided by a bushing. There is no need of finishing the skirt or open end at this time, as the work would only have to be done over again after the piece is roughed out, owing to the distortion in "seasoning." The piston can be held successfully for rough turning true with the core without holding by the skirt.

The piston should be provided with a large boss so that a deep, heavy center can be used. It is the plan to take heavy cuts and a small center hole will not do.

Second Operation.—The piston is mounted on the expanding and centering air-operated mandrel in the Fay automatic lathe as shown in Fig. 1, the outer end being held in place by air-operated tailstock shown in Fig. 2.

In Fig. 1 the three plungers A center the open end with the core, while the closed end is centered by the dead

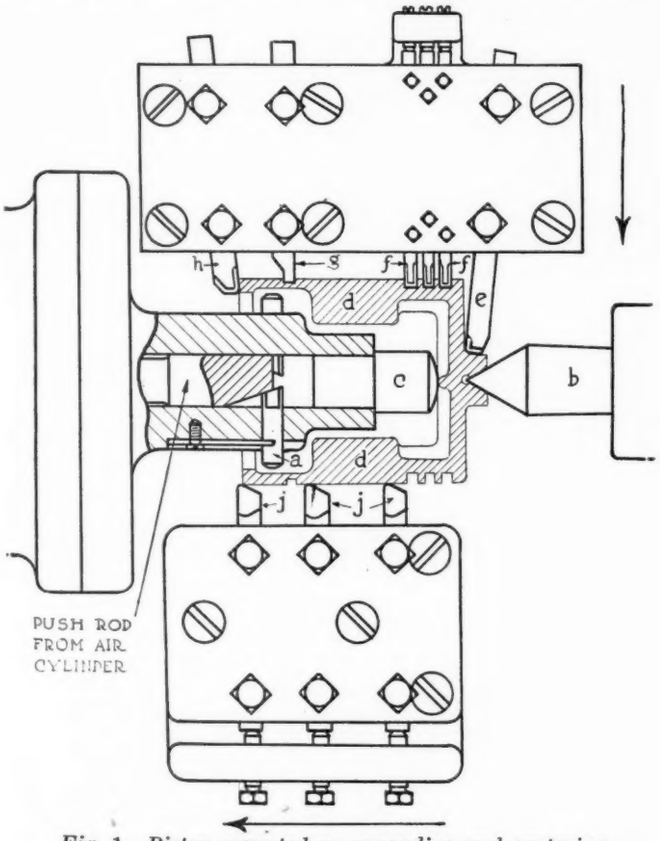


Fig. 1—Piston mounted on expanding and centering mandrel of Fay lathe

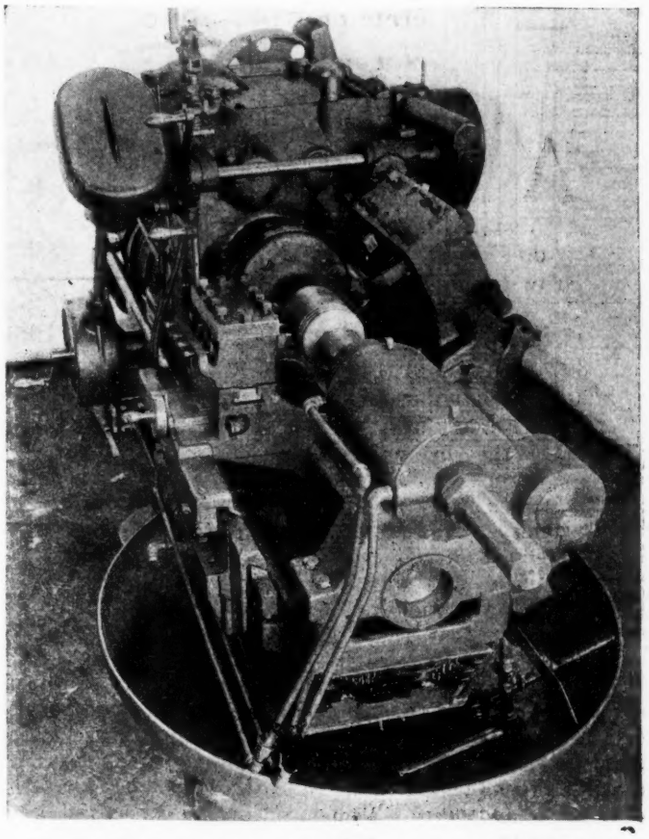


Fig. 2—Outer end of piston held by air-operated tailstock of Fay lathe

center B, drilled true in the first operation. The inner end of the core stops against plug C, giving a uniform thickness of wall to the piston head. Driver D engages the wrist pin lugs and gives a positive drive. The piston is thus centered on the core, strongly supported and driven by a fast operating air mechanism.

The rear tool-holder feeds in radially and carries facing tool E, rough ring-grooving tools F and oil-groove tool G. Tool H faces the open end. The front carriage carries the three turning tools J which feed into depth on an angle, as shown by the arrow, and divide the rough turning between them.

As many tools J are used as are needed to complete the turning in the time it takes tool E to face the end. In other words, the piston is completely roughed out over its entire exterior surface in the time it takes to face the end.

Third Operation.—The piston should now have the wrist pin holes drilled (rough) in a jig which centers on the rough turned exterior, stops against the rough-faced end, and lines up by the bosses on the inside. This operation completes the removal of the bulk of the material.

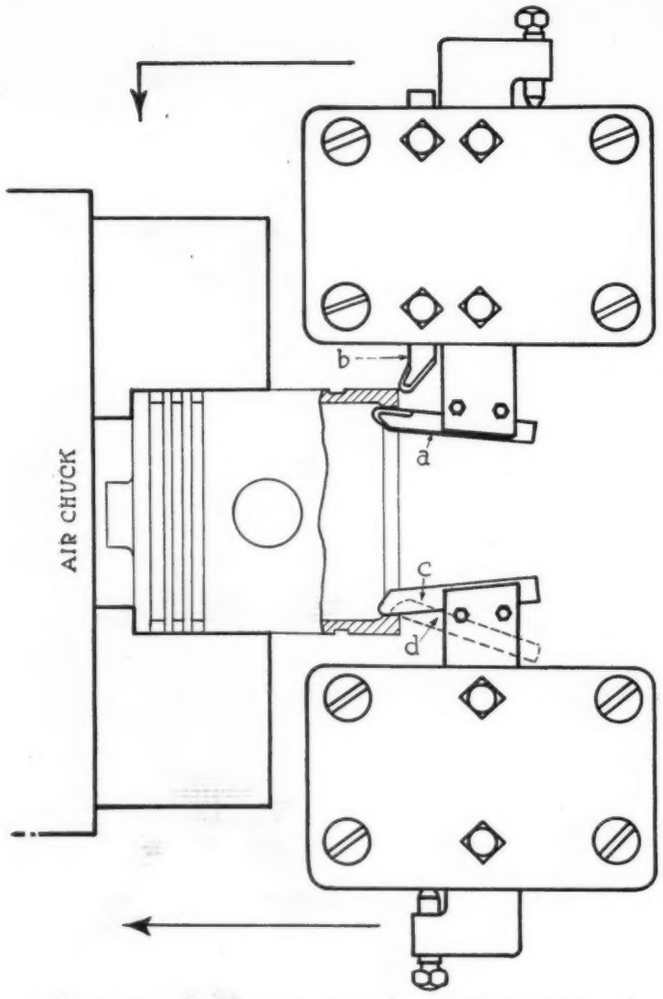


Fig. 3—Jones & Lamson method of finishing skirt end of piston

Fourth Operation.—This is the logical time to anneal. With the scale and surplus material removed, it is possible to eliminate all strains and every chance of future distortion. It is objectionable to remove the pistons from the machine room to an outside heat-treating shop, but this may not be necessary. A modern, continuous feeding automatic furnace can be installed in the shop, right in the production line. Suitable heat insulation and forced ventilation will make the arrangement comfortable even in hot weather.

Fifth Operation.—This is the logical time at which to finish-face and bore the skirt or open end. With strains removed and stock roughed off there is no danger of further distortion. This skirt finishing is done in an air chuck on the Fay automatic lathe as shown in Fig. 3. The back arm moves in the direction shown by the arrow, so that tool A first rough-bores, then tool B finish-faces. The rough-facing was done by tool H in Fig. 1. The front carriage carries only the finish-boring tool C, unless it is desired to break or bevel the corner, in which case a tool D shown in dotted lines is added for the purpose. At the conclusion of the cut the tools, both front and back, withdraw, without scoring the work, to a point which leaves plenty of room to remove the work.

In this operation the work is held by the outside diameter and stopped on the face of the closed end. Since these surfaces were made true and of even dimensions with the core in Fig. 1, the finish-bored skirt will also be true and of the proper dimensions with the core, and may therefore be used from now on for locating the piston. Being held with the skirt projecting well beyond the jaws, there is no distortion from the chucking.

Sixth Operation.—Finish-turning complete comes next. The piston is now seated on a hardened and ground plate on the spindle of the lathe, and held there by a floating center in the quick-acting air tailstock. This center has a ball thrust, and is made floating to obviate the necessity for recentering true with the skirt. The method has been found to be as accurate as holding by draw-rod and loose wrist pin, it avoids the loose piece, and it is much more rapid in operation. The drive is by the equalizing driver D, engaging the wrist pin lugs.

In this operation there are three tool holders, as shown in Fig. 4. The front and back holders are tooled about the same as in Fig. 1. There is an additional grooving attachment carrying tools for grooving the rings. This attachment is strongly supported on the tailstock casting and is operated by the forward movement of the carriage.

In the grooving attachment, tool H give a second roughing cut to the piston grooves. In the rear holder, tool A finish-faces the end of the piston and tools B finish the ring grooves. In the front carriage, tools C, three of them, finish-turn ready for final grinding. With this arrangement the ring grooves are given three cuts in all, permitting great accuracy in the finish surfaces.

The finish turning, grooving and facing operations are completed simultaneously with the end facing operation. Finally, the ring grooves are finished on centers, eliminating all end play of the spindle. This makes it unnecessary to go to the engine lathe for a final grooving operation.

The piston next has the wrist pin holes finished and then goes to the drill press for miscellaneous drilling of oil holes, etc. The center boss is next sawed off in the hand mill, and finished off on a disk grinder. Some firms remove it entirely by disk grinding. It is now ready for the final grinding, which is done on a face plate, holding by the draw-rod and a loose wrist-pin.

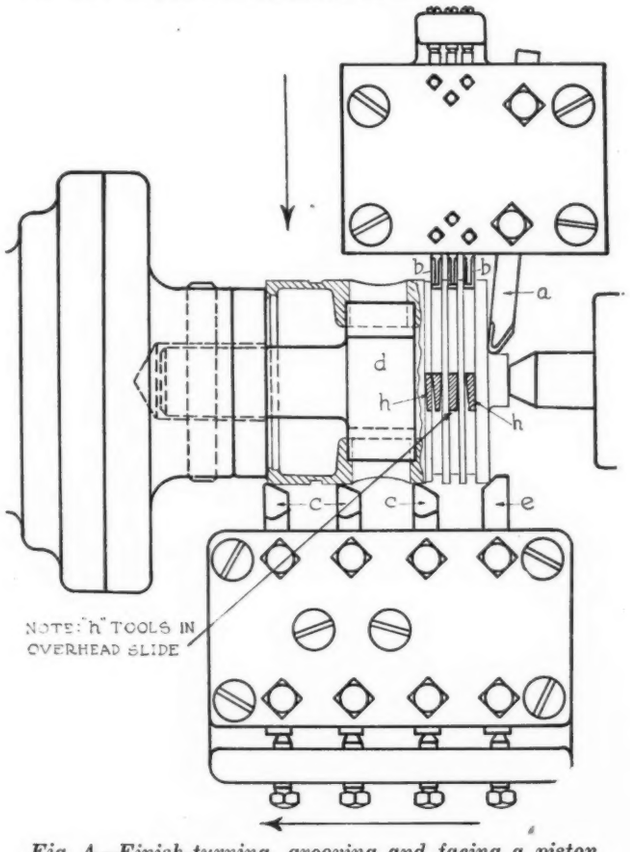


Fig. 4—Finish-turning, grooving and facing a piston in a Fay lathe

The short bed or "ring bevel gear" Fay automatic lathe used for operations 2, 5 and 6 is standard, except that the automatic speed change has been eliminated in each case. A ball thrust is used on the spindle to take the pressure of the air tailstock. The machine is started by the operator and stops itself with a quick active brake on the conclusion of the cut. It is adapted to direct motor drive.

In the first operation an air tailstock and an air mandrel are required in addition to the special tool holders. In the fifth operation an air chuck is required. The sixth operation requires face plate fixtures, air tailstock and special grooving attachment. Reducing valves must be used to limit the pressure on the air tailstock.

For less accurate work the operations can be somewhat simplified and made a trifle more rapid.

A Screw Tap with Shearing Cutting Edge

A RECENT improvement in taps consists in grinding at an angle the cutting edges at the point of the tap. It is held that this gives substantially the same cutting action as that obtained with lawn mower blades, with scissors or with a razor when drawn across the face at an angle. Referring to Fig. 1, cutting edges A at the point of the tap are ground at an angle B to the axis for a distance of three or four threads. This angle, in conjunction with the hook of the land and special flute form, produces a long curling chip, Fig. 2, similar to that of a well-ground lathe tool. This chip is not passed out through the flute as in the ordinary tap, but shoots out ahead of the tool. Hence the name "gun tap" has been given to the tool, which is shown complete in Fig. 3.

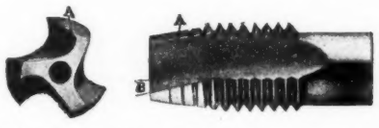


Fig. 1—Cutting edges A are ground at an angle B

Fig. 2—A long curling chip is produced

Fig. 3—Tap made by Greenfield Tap & Die Co.

The flutes are not needed for the passage of chips and therefore are made comparatively shallow, leaving a very large cross-sectional area. In fact, there is as much metal in the threaded section as in the shank, and this makes for unusual strength. All of the cutting is done by the first few teeth, the rest of the thread, acting as a lead screw, steadying the tap and producing accurate work.

The angular cutting edge, with its pronounced hook, shears the metal instead of tearing it off. It is claimed that owing to this shearing action but half the usual power is required and a much cleaner thread is cut in any material. As the grinding is done only on the cutting edges, the tap will cut to size until ground down to the last three or four teeth.

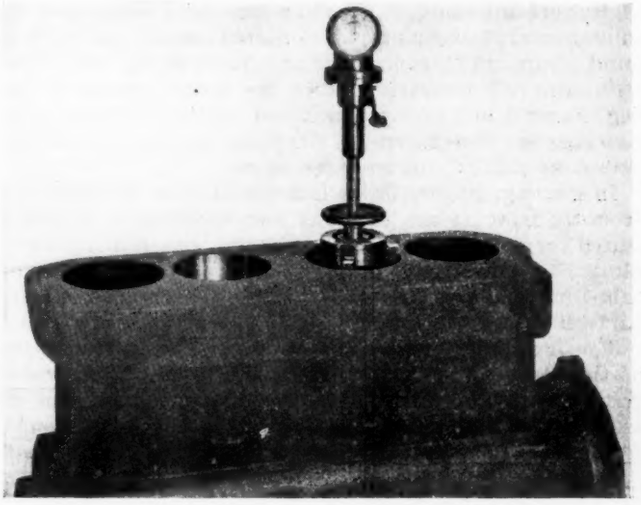
The "gun tap" is said to be specially adapted to the quantity production of accurately tapped holes. Inasmuch as the chips shoot ahead of the tap, it is imperative in blind hole work to provide sufficient bottom clearance, as otherwise the chips jam into the end of the hole and stop the tap with disastrous results. A good general rule for blind hole tapping is to make the clearance equal to one-quarter the depth of the hole. While this necessitates a little extra work for the drill, it is said to be more than compensated for by the increased speed and accuracy.

Improved Cylinder Gage

FOR determining variations in the size of cylinder bores there has been developed a test gage which has the advantage that while the feelers are inside the cylinders the dial indicating the variations is outside and in plain sight. The radial feelers bear against a conical cam, being pressed against the latter by means of suitable springs. This cam is connected to a steel rod, running through an outer casing to a rack and spur movement which operates the dial. By means of a lever connected to the steel rod the cam is lowered, thus permitting the feelers to recede sufficiently for insertion. Once inside the bore, the feelers are released against the inner sides of the cylinder by means of the lever. The manufacturers of this interesting device are the Federal Products Corp.

A centralizing support holds the apparatus in position. It is placed at the mouth of the cylinder, and has three fingers which bind firmly against the walls of the cylinder and which are operated by a hand wheel in connection with a scroll and rack movement. The gage body turns freely and slides in and out through the centralizing support. The dial, which is graduated in thousandths of an inch, can also be turned to any desired position on the axis of the hand wheel.

In practice, the feelers, before insertion in the cylinder, are set to a master gager, while at the same time the face of the dial is turned until the hand points to zero. Then, when the feelers are moved about in the cylinder, all variations from the correct dimensions are indicated by a movement of the dial hand to either side of the zero point.



Cylinder gage of Federal Products Corporation

A Study of the Methods and Operations of Japanning Practice

Part II

This article concludes the detailed report on japanning processes begun by Mr. Darrah in last week's issue. He describes the equipment necessary for the storage, handling, conveying, cleaning and baking departments. The discussion should prove of interest to all production engineers.

By W. A. Darrah *

THE japanning plant includes the following essential equipment:

Japan storage equipment.
Japan handling equipment.
Mechanical conveyor.
Cleaning and baking equipment.

The equipment involved in the storage and handling of the liquid japan has been dealt with briefly in the earlier portion of this paper.

The mechanical conveyor may take many different forms, depending upon the nature of the material to be handled and the desired method of treatment. Each individual plant requires a study of many local factors before a sound recommendation can be made as to type and general characteristics of the conveyor. It is needless to say that the simplest possible type of equipment should be employed and a special effort should be made to avoid both special designs and complicated mechanism. The fact should be kept constantly in mind that difficulty with the conveyor system will completely tie up the plant until it is corrected, involving therefore not only a loss of production and time but possibly causing a large amount of defective work.

With this in view, the conveyor should be provided with ample factors of safety in all parts and present operating practice should be freely considered. The relatively high operating temperatures to which some portions of the conveyor are continuously subjected should be kept in mind from the standpoints of lubrication, wear and strength. At temperatures in the neighborhood of 450 deg. F. most oils are valueless and babbitt or composition bearings are objectionable. Graphite may be used to some extent as a lubricant in these cases.

In passing, it may be of interest to note that the light from the mercury arc lamp has been found to be peculiarly suited for inspection of japanned surfaces. Experience indicates that the monochromatic nature of the light from this source allows the ready detection of cracks and imperfections.

The japanning oven is one of the most important parts of the plant equipment, since on the proper operation of this apparatus depends the uniformity and quality of the output. While there are many conflicting requirements incidental to the successful operation of japanning ovens, a few of the fundamental considerations are summarized below:

Safety.	Economy.
Reliability.	Cleanliness.
Controllability.	Production.

There are two fundamentally different mechanical arrangements employed in the construction of japanning ovens, although both types consist of merely a large (usually metal) box, surrounded by from 3 to 6 in. of heat-insulation. Nonpareil or silocel insulation is excellent for this purpose.

In the case of the earlier or batch type of oven, the material to be japanned is placed in the oven, the doors closed, and the temperature raised to the desired point. The heating is continued for the necessary length of time and usually some means of ventilation is employed. The batch type of oven, when properly operated, will produce excellent results, and is particularly adapted for small plants. Automobile factories producing not more than 100 cars per day can obtain excellent results with this type, although it will be evident that continual supervision by skilled and responsible help is necessary since not only must temperatures and time be controlled, but the rate of temperature changes must be carefully watched. The fuel economy in the case of the batch oven is usually much lower than in the case of the continuous oven and the labor charges are much higher. The production per given investment also is lower with the batch oven.

The continuous japanning oven differs from the batch oven only in that it is a long heat-insulated box, usually open at both ends and equipped with conveying means for continuously carrying the material to be treated through the oven. In all plants having a production materially in excess of 100 cars per day the continuous oven is preferable.

Continuous ovens are constructed in many varying designs, some typical installations being shown in the cuts herewith. For treating automobile bodies (in those cases which are now becoming relatively numerous, in which there are no wooden parts built into the metal body), it is usual practice to employ an oven about 140 ft. long, 5 ft. wide and 6 ft. high. The ovens are usually entirely horizontal in this case but are frequently provided with vestibules that serve to reduce the circulation of cold air from without, thus keeping the temperature within the oven higher and more uniform. In the case of body ovens, two parallel horizontal chains are used for conveyors, the

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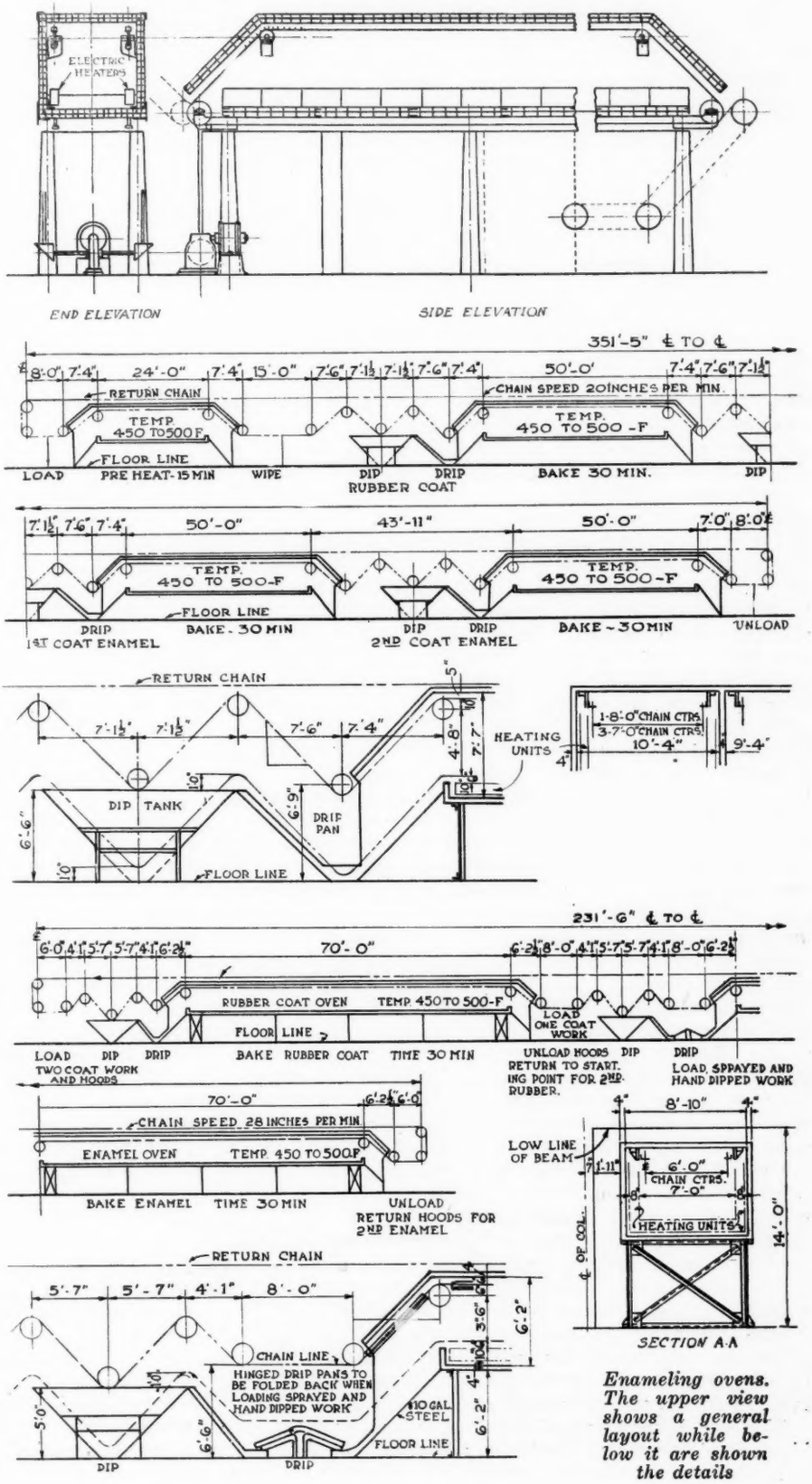
chains sliding in steel channels or angles at a level of about 2 ft. from the floor. The bodies to be japanned are placed on the conveyor with about 4 ft. of space between each body. In the case of an oven 140 ft. long, operated at a temperature of 450 deg., a 45-min. baking period is desirable, thus allowing a speed of travel for the conveyor of about 3 ft. per min. This rate of travel permits ample time for inspection as the bodies leave the oven and the application of a second coat of japan before the bodies enter the second oven. Under these conditions a period of 10 to 15 min. is allowed for inspection and applying the next coat. This, of course, requires a distance of about 30 ft. on the basis of travel of 3 ft. per min. The above figures should not be considered as the only satisfactory design, but are merely given as being typical of successful installations now in operation.

The question of ventilation for japanning ovens has been discussed earlier in this article and it is merely necessary to give some typical figures illustrative of present practice. An oven adapted for the japanning of light automobile bodies, with a production of about 12 bodies per hour, will require an air circulation approximately equal to 1200 cu. ft. of fresh air per minute. There are at the present time a large number of japanning ovens employing natural ventilation to cause the necessary air change. In the writer's opinion, this is unfortunate, since the operator cannot control the rate of circulation or the nature of the incoming air.

A second type of japanning oven is illustrated in the cut and represents present practice in the treatment of automobile fenders and similar light parts. It will be noted in this case that the entire process of dipping, dripping, baking, etc., is carried out automatically. Manual labor is required only in placing the pieces to be treated on the conveyor, inspecting them and removing them when completed.

As will be noted from the cuts there are two typical methods of reducing the leakage of hot air from the oven and the consequent entrance of cold air. Both methods depend upon the lower specific gravity of warm air which causes it to rise. In the one case the oven is located on the roof, while the material to be japanned enters at one of the lower floors, passing up an incline before it reaches the hottest portion of the oven. Another method of obtaining substantially the same result, but modified to deliver the finished product nearer the point of which it enters, is shown in the case of the double deck fender oven illustrated herewith.

There are in use to-day at least three different means of supplying heat to japanning ovens. The oldest and least satisfactory arrangement consists of having a number of gas burners placed beneath the floor level of the ovens and so arranged that the gasoline products of combustion will pass upward and impart a portion of their heat to the materials to be japanned.



Enameling ovens. The upper view shows a general layout while below it are shown the details

The objections to such a system are obvious. The temperatures are not subject to accurate control, the temperature of the ovens is not uniform throughout, the dangers of fire from an open flame are excessive, the products of combustion passing through the oven frequently contain traces of soot and always large amounts of water vapor. As a result of these conditions the quality of the work produced by an oven of this type is not as satisfactory as that of later types, and with the present price of gas the operating costs are high. Careful supervision is necessary.

Electric Ovens

The electrically-heated oven has been widely introduced and is in successful use at a large number of plants. Electric heat allows simple and accurate control, permits a relatively uniform temperature throughout the oven, and is free from the objections of soot and water vapor inherent in the gas-fired oven. The most serious objection to the electrically-heated oven is the extremely high cost of this form of heat. A consideration of the fact that even large power users cannot as a rule secure a lower rate for japanning equipment than from 1 to 1½ cents per kilowatt hour will make evident the very high costs involved. For example, one large automobile manufacturer producing approximately 1000 cars per day has a power bill for japanning ovens alone of about $1,500 per day. For purposes of comparison, it may be stated that the same service secured from japanning ovens heated by the combustion of fuel oil would cost not over $400 per day, giving a yearly saving of over $300,000. The combustion system referred to above will be referred to later in this report. It should be noted that while the electrically-heated oven can be easily controlled and is normally very reliable, yet in this case the manufacturer is dependent upon power service, and in case of any interruption of the central station service his ovens are closed down, thus stopping all production and possibly causing a material loss of product.

The third and more modern system of applying heat to japanning ovens, consists of the so-called "air-heated type," in which the ventilating air and radiant heating flues are both maintained at the desired temperature by the combustion of fuel oil or gas in a small separate oven.

A typical schematic outline of this system is shown on the opposite page. It will be noted that a small separate oven composed of refractories serves as a fire box or combustion chamber in which the fuel is burned. Mounted above this are a series of air heaters which are divided into three groups. The first and smallest group is employed to supply preheated air for the combustion of the fuel in the heating oven. The second and largest group is used to heat a volume of circulating air which passes through flues arranged longitudinally along the sides of the oven and out, returning through a blower to the heaters. This volume of air serves to transfer heat which is produced at high temperatures in the combustion oven to the material to be japanned where the temperatures are relatively much lower. One large installation of this kind, which may be considered as typical, has been designed on the basis of 650 deg. F. for the temperature of the air entering the radiating flues and 450 deg. F. for the air when leaving the radiating flues. The third set of heaters employed in this system are used to preheat the air used for ventilating purposes, thereby overcoming one of the serious difficulties with the earlier type of electrically-heated oven, namely, lack of uniform temperature throughout the different portions of the oven.

This system may be modified in such a manner that one blower and one set of air heaters is sufficient.

It will be noted that this latter air-heated type of japanning oven permits of securing all of the advantages of the other types of ovens, with the additional advantages of economy, reliability and controllability. It will be apparent that by the use of large radiating flues, which cover substantially the entire side walls of the oven and which are maintained at temperatures about 200 deg. higher than that of the oven, a large amount of radiant heat is applied to the material to be japanned, with the resultant advantages which have been outlined in the earlier portion of this report.

On the other hand, the preheating of the circulating air insures that a large amount of warm entering air will be at all times passing through all portions of the oven, thus eliminating the "cold pockets" which are a troublesome feature of the electrically-heated oven. This forced circulation of warm gases also prevents the accumulation of the relatively heavy volatile products formed during the drying of the japan. The fact that the pressure within the japanning oven by this system is somewhat greater than the external atmospheric pressure (although only a small fraction of an ounce) overcomes the difficulty which is sometimes acute in the electrically-heated oven resulting from the flowing in of cold air in the horizontal type of oven, owing to the draft induced by the exit of the circulating air, or by the difference in weight of the cold and warm air.

On the present basis of fuel oil, at approximately 4 cents a gallon, it has been found that an oil consumption not over 50 gallons per hour will entirely supply heat to a continuous body japanning oven 140 ft. long and having an output of at least 12 automobile bodies per hour. This results in an actual operating saving equal to nearly two-thirds of the cost of power for an electrically heated oven.

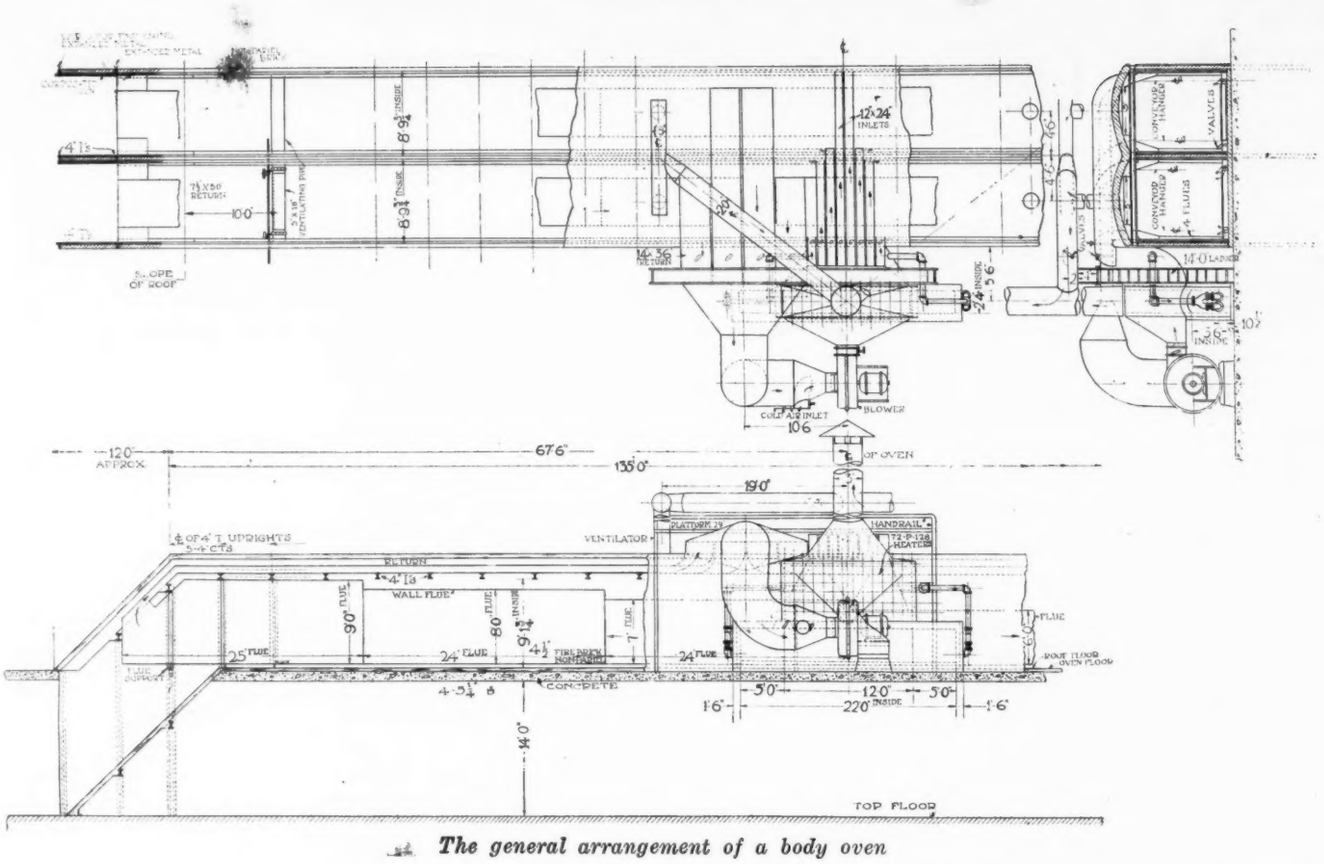
In the case of the air-heated oven described above, it will be noted that none of the products of combustion enter the oven and therefore the difficulties inherent in the earlier types of gas-heated ovens are avoided. Obviously, no soot or water vapor is carried into the oven from the heating chamber.

Temperature Control

In order to continuously produce work of a high quality, absolute control of the temperature throughout the japanning oven is essential. From the foregoing discussion on the properties and characteristics of japan, it will be evident that if the time during which the bodies are submitted to the baking temperature is kept constant the temperature must also be maintained constant or the japan will be either under-dried or over-baked.

Commercial practice has finally reduced successful temperature control to the basis of a pyrometer either operated by a thermo couple or a variable resistance. In either case the change in electric current caused by the change in oven temperature operates a meter which is connected to a relay. The relay is used to close a power circuit controlling an electrically-operated switch in the case of an electrically-heated oven, or an electrically-operated oil and air valve in the case of the air-heated oven. The quickness of response to slight temperature variations is substantially the same in both cases.

In the case of a long oven (75 to 150 ft.) it is usually good practice to divide the temperature control of the oven into two or more sections, each of which may be controlled individually. It is not uncommon in the case of an oven 135 ft. long to place four thermo couples in the roof along the center line of the oven, and approximately equally spaced. In this case the four sections of the oven would be controlled individually and automatically. It is also common practice to provide manual control in addition to automatic control, in order that the temperature of the oven as a whole may be varied when necessary. The neces-



The general arrangement of a body oven

sity for such variation has resulted quite largely from the use of natural draft, and the consequent variation of oven temperature variation is materially less in the case of those ovens in which the ventilating air is preheated and supplied under slight pressure, so that oven conditions and air circulation are independent of weather variations.

It has been previously pointed out that essentially the japanning oven consists of an insulated box provided with heating means and conveyor equipment. There are naturally many different mechanical constructions in use, many of which give satisfactory results.

From the standpoint of heat insulation it is good practice to have the walls at least 4½ in. in thickness, and in case electric power is used for heating, a materially greater thickness is warranted because of the very material economy obtained in operation. Obviously a thinner wall is allowable in the oil-heated oven and the initial cost is therefore much less.

It is desirable, in designing the oven, to have a minimum of external exposed radiating surface per unit volume of useful oven space. In other words, when possible, two or more ovens should be grouped together, thus reducing radiating losses. In connection with the location of ovens, it may be pertinent to suggest that in many cases they may be placed on the roof, thus economizing floor space which may be applied to other purposes. Some of the types of ovens illustrated herewith are particularly applicable to this arrangement.

In constructing a japanning oven it is essential that the walls be air-tight in order that there may be no leakage of gases either into or out of the oven, other than as provided by the ventilating equipment. The oven structure should be as light as possible consistent with mechanical strength.

In designing an oven structure consideration must be given to the fact that in a length of 100 ft. to 150 ft. the total expansion resulting from a temperature change of about 400 deg. may be several inches, and proper provision must be made for this factor. Particularly in case ventilating and heating flues are introduced, and designed to operate at higher temperatures than the balance of the oven, the factor of thermal expansion must be considered.

Much stress has been laid upon the desirability of avoiding all so-called "through metal" in oven construction. Undoubtedly all metal which extends from the inside of the oven to the exterior serves as a source of loss by heat conduction, but it is the writer's opinion that in many cases this factor has been unduly emphasized, for trade reasons, and possibly with a sacrifice of other advantages.

In the foregoing report the writer has endeavored to briefly outline some of the fundamental considerations connected with modern japanning practice. The art of japanning, like any other modern industry, is subject to many variable conditions, depending upon materials used, results desired, and many other factors.

It is the writer's feeling, that in this industry, as in most cases, it is dangerous to assume a dogmatic position and claim that all who differ are wrong. Without doubt, many of the practices which have been recommended may well be modified to suit special local conditions, while on the other hand there may very possibly be instances in which practices which do not appear to be desirable may be employed to advantage. It is sincerely hoped that this investigation may lead to the development of the japanning industry, and to the consideration of the engineering details involved from a scientific standpoint rather than by the "rule of thumb" method.

ACCORDING to an item in an English newspaper Ernest Bury of the Skinningrove Iron Works has succeeded in extracting alcohol from coke-oven gas on a commercial scale. The report declares that if the process were applied to all of the coal carbonized in Great Britain it would yield 50,000,000 gal. of fuel alcohol yearly.

The Use of the Hollow Strut on the New Airplanes

An analysis carried out to determine the possible saving in weight as compared with solid struts—Hollow struts of different proportions and of wood and steel respectively are considered in detail in this article

By Edward P. Warner*

THERE has been a trend recently toward the use of hollow wooden struts, built up from several pieces of spruce, on airplanes. That this leads to a saving of weight there can, of course, be no question. Interplane struts are long members subjected to direct compression, and the superior weight-strength efficiency of a tube, as compared with a solid rod, under such a loading, is too well known to need remark. The interplane struts, however, are exposed to the wind, and it is accordingly necessary to keep the parasite resistance, as well as the weight, to the lowest possible figure.

The relative importance of reducing the weight and the resistance can best be studied by the use of the concept of "equivalent weight," first employed in the report of the British Advisory Committee for Aeronautics for 1911-12. If the weight of a strut, or of any other part of an airplane, is increased, the machine must either fly faster or increase its angle of incidence in order to secure sustenation. If the speed changes while the angle of incidence remains constant the ratio of lift to drag will remain constant, and the propeller thrust will have to be increased by an amount equal to the added weight divided by the lift-drag ratio. If, on the other hand, the angle of incidence changes, the lift-drag ratio will change, and it is not possible to say at once what total effect the change will have on resistance. The maximum lift-drag ratio for complete airplanes is usually found at an angle between 6 and 8 deg., and small changes of the incidence in the neighborhood of this angle will accordingly have very little effect on the lift-drag ratio. For angles smaller than these, the L/D increases as the angle increases, and an addition of weight will therefore improve the overall efficiency of the machine, although it will increase its total resistance.

It is evident that the best arrangement for one condition of flight may not be the best for all, and it is necessary to specify the speed or angle to be considered if a rigorous determination of the best form of strut, the best wing section, or anything else of a like nature, is to be made. Where all-around efficiency at all speeds is desired, a compromise must be made between the various arrangements best suited for particular sets of conditions. In the present investigation, the best type of strut will first be determined for the angle corresponding to the maximum L/D ratio for the complete machine. This is in the neighborhood of (a little smaller than) the best climbing angle. The maximum L/D varies considerably with the type of airplane, but 7.5 may be taken as a fair average value. An increase of 7.5 lb. in the weight of the airplane will then require an increase of 1 lb. in the propeller thrust, and this increase would be substantially the same, in this particular case, whether the necessary gain in lift were secured by an increase of speed or an increase of angle. An increase of 7.5 lb. in the weight of an interplane strut is therefore equivalent to an increase of 1 lb. in the resistance. The "equivalent weight" of any strut is then

$$W_e = W + 7.5\ R,$$

where W is the weight of the strut and R its parasite resistance at the speed normally corresponding to flight at the angle of maximum L/D. The relative merits of struts of different sections are indicated by the values of W_e, that section being the best which has the smallest value for this quantity. In order to make the comparison a fair one, the struts compared must, of course, be of equal strength. Since their length is very great in comparison with their diameter, the failing load of interplane struts is determined by Euler's formula, and struts of equal strength must therefore have the same least sectional moment of inertia. The simplest means of making comparisons among a series of struts is to choose a diameter for some standard section and compute the diameter which struts of the various other sections would have to have in order that they might have the same least moment of inertia, and so the same strength. Knowing this, the weight, resistance and "equivalent weight" can be computed for struts of each section.

The relative values of the merit factors for the various sections depend somewhat on the diameter initially chosen for the standard section. Since the weight per unit of length goes up as the square of the diameter, while the resistance only varies as the first power, the weight becomes more and more important as the diameter increases, and it is profitable on large airplanes to use struts of smaller fineness ratio, greater weight-strength efficiency and larger resistance than would be advisable on small machines where the strut weight is small in any case. A number of strut sections of different forms are shown in Fig. 1 and the weight per running foot, resistance per running foot at 60 m.p.h., and merit factor W_e are tabulated below for two different assumptions. The first set of figures relate to struts having a strength equal to that of a circular rod 1 in. in diameter, the second set to struts equal in strength to a circular rod 2½ in. in diameter, these being taken as representative of the extremes of size met with in present-day practice. The column headed b gives the width of section, measured perpendicular to the wind direction, of a strut having the required strength. Most of the struts included in the table were tested at the British National Physical Laboratory during 1912 and 1913, some of them having been designed by the staffs of the Laboratory and the Royal Aircraft Factory, the remainder having been tried at the suggestion of Alec Ogilvie. A few of the sections, however, have been more recently developed here and abroad. Two or three simple geometrical forms are included for comparison. The weights are for solid spruce struts. If a higher speed than 60 m.p.h. were to be used as a stand-

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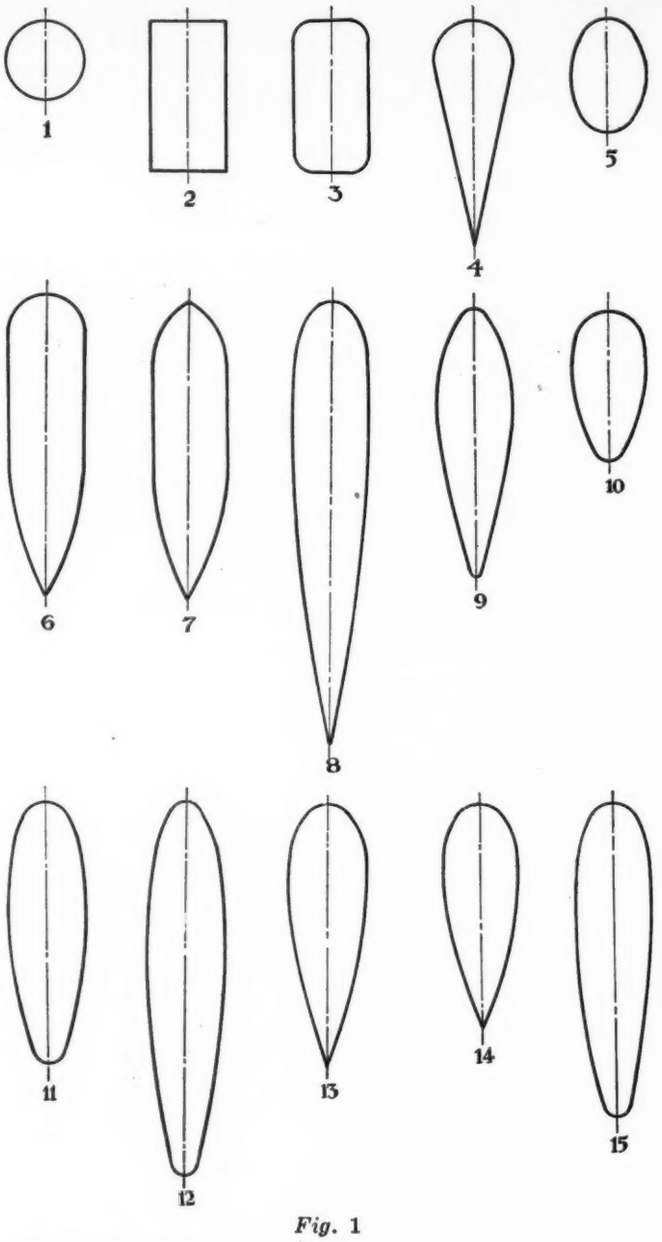

Fig. 1

ard of comparison, the struts of low resistance and fairly high fineness ratio would make a better showing.

No. of strut	First Series. b	W	R	We	Second Series. b	W	R	We
1	1.000	0.164	0.819	6.30	2.50	1.03	2.018	16.41
2	0.735	0.225	0.768	5.98	1.84	1.41	1.920	15.81
3	0.779	0.229	0.223	1.90	1.95	1.43	0.558	5.62
4	0.905	0.274	0.570	4.55	2.26	1.71	1.425	12.40
5	0.794	0.220	0.293	2.42	1.98	1.38	0.733	6.88
6	0.684	0.314	0.112	1.15	1.71	1.96	0.280	4.06
7	0.705	0.309	0.095	1.02	1.76	1.93	0.238	3.72
8	0.676	0.411	0.091	1.09	1.69	2.57	0.228	4.28
9	0.713	0.313	0.105	1.10	1.78	1.96	0.263	3.93
10	0.845	0.228	0.210	1.80	2.11	1.43	0.525	5.37
11	0.735	0.303	0.084	0.933	1.84	1.89	0.210	3.47
12	0.676	0.398	0.082	1.01	1.69	2.49	0.205	4.03
13	0.751	0.290	0.074	0.845	1.88	1.81	0.185	3.19
14	0.784	0.271	0.091	0.953	1.96	1.69	0.228	3.40
15	0.696	0.339	0.104	1.12	1.74	2.12	0.260	4.07

It will be noted that, while No. 13 has the lowest "equivalent weight" for both cases, there are numerous changes in order between the two, in so far as the other struts are concerned, and that, in general, the struts of small fineness ratio stand better in the second tabulation than in the first.

In the discussion thus far it has been assumed that all struts are solid. The same method of comparison will now be extended to hollow struts, to determine the amount of hollowing which is profitable in struts of any given form. It will be assumed, for the purposes of the analysis, that the cross-sectional form of the inner boundary of the cross-section of the hollow strut is geometrically similar to that of the outer boundary. In other words, the thickness of the wall varies at different points, being greatest at the front and back, least on the sides. This is not, of course, by any means the usual way of making a hollow strut, but it is an assumption which greatly simplifies the treatment, and the effect of departures from it will be discussed later in the article.

In what follows, b_1 and b_2 refer, respectively, to the outside and inside breadths of the cross-section, and C_1, C_2, etc., are arbitrary constants, depending on the type of strut and on the other conditions of the problem.

Since the resistance depends only on the outside dimensions, it may be written

$$R = C_1 \times b_1$$

The weight per unit length is given by the expression

$$W = C_2 (b_1^2 - b_2^2)$$

and the moment of inertia of the cross-section by

$$I = C_3 (b_1^4 - b_2^4) = W \times \frac{C_3}{C_2} \times (b_1^2 + b_2^2)$$

Since the moment of inertia is constant for a given strength (it is assumed that the walls are thick enough to prevent local buckling or crinkling, so that failure will occur in every case by elastic instability of the strut as a whole).

$$I = K$$

where K is another constant depending on the required strength of the member.

Then

$$K = W \times \frac{C_3}{C_2} \times (b_1^2 + b_2^2)$$

And

$$W = K \times \frac{C_2}{C_3} \times \frac{1}{b_1^2 + b_2^2}$$

The "equivalent weight" is then

$$W_e = \left(K \times \frac{C_2}{C_3} \times \frac{1}{b_1^2 + b_2^2} \right) + (7.5 \times C_1 \times b_1)$$

From the equation for moment of inertia,

$$b_2 = \sqrt[4]{b_1^4 - \frac{K}{C_3}}$$

Substituting this value in the preceding expression,

$$W_e = \left(K \times \frac{C_2}{C_3} \times \frac{1}{b_1^2 + \sqrt{b_1^4 - \frac{K}{C_3}}} \right) + (7.5 \times C_1 \times b_1)$$

In order that W_e may be a minimum, its derivative with respect to b_1 must be zero.

$$\frac{dW_e}{db_1} = -\left[K \times \frac{C_2}{C_3} \times \frac{2b_1 + \frac{4b_1^3}{2\sqrt{b_1^4 - \frac{K}{C_3}}}}{\left(b_1^2 + \sqrt{b_1^4 - \frac{K}{C_3}} \right)^2} \right] + 7.5\, C_1 = O$$

$$7.5\, C_1 = 2K \times \frac{C_2}{C_3} \times b_1 \times \frac{1}{\left(b_1^2 + \sqrt{b_1^4 - \frac{K}{C_3}} \right) \times \sqrt{b_1^4 - \frac{K}{C_3}}} =$$

$$2K \times \frac{C_2}{C_3} \times b_1 \times \frac{1}{(b_1^2 + b_2^2) \times b_2^2}$$

The values of b_1 and b_2 which satisfy this equation can be found by trial.

Suppose, for example, that it is desired to find the best degree of hollowing for a strut which must have a least moment of inertia of 1 in.^{4} and which is to be used on a machine traveling at 60 m.p.h. C_1 may be taken at 0.1, C_2 as 0.515, and C_3 as 0.155, these figures being approximately correct for strut No. 13 in the table.

Then

$$7.5\,C_1 - 2\,K \times \frac{C_2}{C_3} \times b_1 \times \frac{1}{(b_1^2 + b_2^2) \times b_2^2} = .75 - \frac{6.65\,b_1}{(b_1^2 + b_2^2) \times b_2^2} = \frac{d\,W_e}{db_1}$$

A series of values may then be tried and the results tabulated.

b_1	b_2	$\frac{dW_e}{db_1}$
1.60	0.59	—9.70
1.65	0.99	—2.28
1.70	1.17	—1.18
1.75	1.31	—2.28
1.80	1.42	—0.37
1.85	1.51	—0.20
1.90	1.60	—0.06
1.95	1.68	+0.06

It is evident that the best dimensions for this strut would be:

$$b_1 = 1.92 \text{ in.} \quad b_2 = 1.64 \text{ in.}$$

For a hollow strut of that size W_e would be 1.96, as against 2.50 for a solid strut of the same strength. The substitution of hollow struts for solid ones therefore leads to a clear saving of 22 per cent of the total power required to carry those members and overcome their resistance during a climb at 60 m.p.h.

The equation for $\frac{dW_e}{db_1}$ is not independent of b_1 and it is profitable to hollow out large struts more in proportion to their size than small ones. If, for instance, in the example just taken up, the required value of I were 0.2 in.^{4} instead of 1.0 in.^{4}, the best values of b_1 and b_2 would be 1.21 and 0.96 in., respectively. For this strut the best wall thickness would be 10 per cent of the breadth, whereas, for the larger strut previously considered, it was only 7.3 per cent.

Increasing the speed accentuates the importance of resistance, which depends only on outside dimensions, and the effect is therefore of the same nature as is that of decreasing required strength. If a strut were to be chosen to have a moment of inertia of 0.2 in.^{4} and to be used at 80 m.p.h., the outside and inside breadths should be 1.15 and 0.82 in. respectively.

An analysis of the same sort may be carried through for tubular steel struts. Since the interplane struts are always long enough to fail by buckling, their crippling load depends only on the modulus of elasticity of the material and the least moment of inertia of the cross-section. The modulus of elasticity of steel being about 17.5 times as great as that of spruce, the sectional moment of inertia of a wooden strut must be 17.5 times as great as that of a metal one for a similar situation. Reverting to the first numerical case which was considered, I for a steel strut would have to be 0.0571 in.^{4}. The equation for the slope of the "equivalent weight" curve would be:

$$\frac{dW_e}{db_1} = 0.75 - \frac{6.08\,b_1}{(b_1^2 + b_2^2) \times b_2^2}$$

and the best dimensions:

$$b_1 = 1.630 \text{ in.} \quad b_2 = 1.607 \text{ in.}$$

The difference between the outside and inside breadths is so small that the walls would be unable to resist crinkling, so that the only rule that can be laid down in this case, as for most other problems involving steel struts, is that the walls of the tube should be made as thin as possible without risking local failure. If the strut were made to the ideal dimensions just determined, W_e would be 1.80, or about 8 per cent less than for the best hollow wooden strut to fulfill the same conditions. At higher speeds the steel strut would show up still better in comparison with the wooden one. The steel struts are also well fitted for use where great strength is required, as the wall thickness can be brought nearer to the ideal in a large strut than in a small one, especially if the large strut is built up of sheet metal and provided with internal reinforcing to guard against crinkling or other local failure.

The discussion so far has dealt entirely with the performance of struts under the conditions corresponding to best rate of climb. In many cases, particularly in the case of pursuit machines, efficiency at maximum speed is quite as important as at economical speed, and the best form of strut for use at small angles of attack and high speeds will now be taken up.

It will be assumed that the loading per unit of wing area is maintained constant in all conditions, and that the angle of attack for a given speed therefore has the same value, whatever strut may be used. The assumption will further be made that the total resistance at maximum speed is equally divided between wing drag and parasite resistance. This approximates the distribution of resistance in most fast airplanes. Any increase in strut weight will require an increase in area of supporting surface in order that the loading may be kept constant. The increased surface, in turn, will require a greater length of struts and wires for bracing, and will therefore be the direct cause of an increase in parasite resistance. The parasite resistance of the body and chassis is substantially independent of the area of supporting surface, and it may therefore be assumed that the total parasite resistance varies as the square root of the wing area.

The equation for total resistance is then:

$$R = D_c\,SV^2 + K'\sqrt{S}\,V^2$$

where D_c is the drag coefficient of the wings and K' is a coefficient of total parasite resistance. Since S is proportional to W, the total weight of the machine,

$$R = (C'W + C''\sqrt{W}) \times V^2$$

Differentiating to determine the effect which a change in W has on R,

$$\frac{dR}{dW} = \left(C' + \frac{C''}{2\sqrt{W}}\right) V^2$$

Since parasite resistance and wing drag were initially equal,

$$C'W_o = C''\sqrt{W_o}$$

$$\frac{C'}{C''} = \frac{1}{\sqrt{W_o}}$$

As any changes in W due to change of the struts would be relatively small, W_o may be substituted for W in the expression for the derivative, which then becomes:

$$\frac{dR}{dW} = \frac{3}{2} \times C' V^2$$

Since

$$C'WV^2 = D_c S V^2$$

and

$$W = L_c S V^2,$$

$$C'V^2 = \frac{D_c}{L_c}$$

and

$$\frac{dR}{dW} = \frac{3}{2 \times \frac{L_c}{D_c}}$$

where $\frac{L_c}{D_c}$ is the lift-drag ratio for the wings alone.

The increase in weight due to the use of heavier struts includes not only the added weight of the struts themselves, but also the weight of the added wing surface required to keep the loading constant. As the weight of the wings and their trussing is about one-eighth of the total weight of an airplane, the added wing weight will be one-seventh of the added strut weight. The formula for the total resistance due to weight of struts is then:

$$R = \frac{8}{7} \times \frac{3}{2} \times \frac{1}{\frac{L_c}{D_c}} \times W = \frac{12}{7 \times \frac{L_c}{D_c}} \times W$$

Adding to this the resistance of the strut itself, the total "equivalent resistance" of one foot of strut is

$$R_e = \left(\frac{12}{7 \frac{L_c}{D_c}} \times W \right) + R$$

For biplanes in which the maximum speed is two and a half times the landing speed, this being the average ratio of speed range for present-day fighting machines, the lift-drag for the wings alone is about 9 at maximum speed. The equation for "equivalent resistance" is then:

$$R_e = \frac{12}{7 \times 9} \times W + R$$

Dividing by the coefficient of W to secure the "equivalent weight,"

$$W_e = W + 5.25 \times R$$

where R is the resistance of one foot of strut at the maximum speed of flight.

As an illustrative example, a strut may be designed for the third of the cases examined at climbing speed (least moment of inertia = 0.2 in.^{4}). The maximum speed may be taken as 130 m.p.h., this being about the figure which would be realized in a pursuit machine having an economical speed of 80 m.p.h. The best dimensions for a strut under this condition are:

$$b_1 = 1.10 \text{ in.}, \quad b_2 = 0.65 \text{ in.},$$

and the reduction in "equivalent weight" by using this strut instead of a solid one is only 3 per cent. Solving the same problem for a steel tubular strut,

$$b_1 = 0.691 \text{ in.}, \quad b_2 = 0.626 \text{ in.},$$

and W_e is reduced 23 per cent as compared with the value for the best wooden strut.

The analysis has so far been confined, as already noted, to the case in which the form of the hollowed-out portion is geometrically similar to the cross-sectional form of the strut. This assumption of similarity simplifies the algebraic work and does very well as a first approximation, but a second approximation can be made, if desired, taking account of the true form much more closely. The same equations may now be written down for a strut of constant wall thickness, working under the same conditions as those for which the approximate analysis has already been carried through—

($I = 1.0$ in.^{4}, speed of 60 m.p.h., strut No. 13).

Strut No. 13 in Fig. 1 has a fineness ratio (ratio of length to breadth of section) of 3.5. The form of strut originally determined, with the inner and outer outlines of similar form, is shown in Fig. 2, from which it is perfectly evident that an unnecessarily large amount of material is concentrated in the nose and tail of the section. If the wall thickness is kept constant at all points of the periphery, the relations among the dimensions are:

$$b_1 - b_2 = l_1 - l_2 = 3.5\, b_1 - l_2$$

$$l_2 - b_2 = 2.5\, b_1$$

where l_1 and l_2 are the lengths of the strut section and of the section of the hollowed-out portion, as shown in Fig. 2. The fineness ratio of the hole is then

$$\frac{l_2}{b_2} = \frac{2.5\, b_1 + b_2}{b_2} = 1 + \left(2.5 \times \frac{b_1}{b_2} \right)$$

Struts which are alike in every respect except in fineness ratio have coefficients in weight and of moment of inertia proportional to their fineness ratios. The deduction of weight and moment of inertia due to the removal of the central portion of the section must therefore be increased in the ratio

$$\frac{1 + \left(2.5 \times \frac{b_1}{b_2} \right)}{3.5}$$

The equation for weight per running foot of strut No. 13 becomes

$$W = .515 \times \left[b_1^2 - b_2^2 \times \frac{1 + \left(2.5 \times \frac{b_1}{b_2} \right)}{3.5} \right] = .147 \times$$

$$[3.5\, b_1^2 - b_2^2 - 2.5\, b_1 \times b_2]$$

The resistance of a running foot at 60 m.p.h. is, as before,

$$R = 0.1\, b_1$$

and the "equivalent weight" is

$$W_e = 0.147 \times [3.5\, b_1^2 - b_2^2 - 2.5\, b_1 \times b_2] + 0.75\, b_1$$

Then

$$\frac{dW_e}{db_1} = 0.147 \times \left(7\, b_1 - 2\, b_2 \times \frac{db_2}{db_1} - 2.5\, b_2 - 2.5\, b_1 \times \frac{db_2}{db_1} \right) + 0.75$$

Since the moment of inertia of the section of material removed, like its weight, is directly proportional to the fineness ratio,

$$I = 0.155 \times \left[b_1^4 - b_2^4 \times \frac{1 + \left(2.5 \times \frac{b_1}{b_2} \right)}{3.5} \right]$$

$$= 0.044 \times [3.5\, b_1^4 - b_2^4 - 2.5\, b_1 \times b_2^3]$$

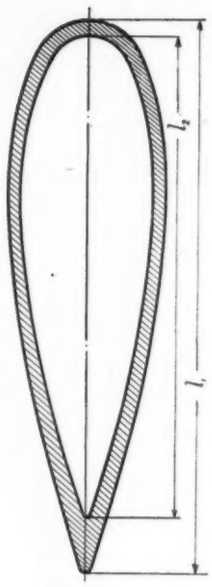

Fig. 2

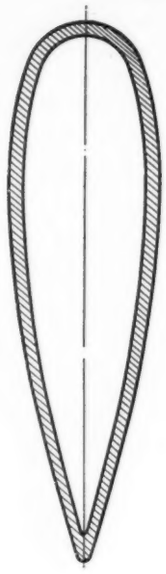

Fig. 3

I being fixed, the differential of this expression may be taken:

$$14\,b_1^3 \times db_1 - 4\,b_2^3 \times db_2 - 2.5\,b_2^3 \times db_1 - 7.5\,b_1 \times b_2^2 \times db_2 = 0$$

$$\frac{db_2}{db_1} = \frac{14\,b_1^3 - 2.5\,b_2^3}{4\,b_2^3 + 7.5\,b_1 \times b^2_2}$$

Substituting this value in the expression for the derivative of W_e with respect to b_1,

$$\frac{dW_e}{db_1} = 0.147 \times \left[7\,b_1 - 2.5\,b_2 - (2.5\,b_1 + 2\,b_2)\left(\frac{14\,b_1^3 - 2.5\,b_2^3}{4\,b_2^3 + 7.5\,b_1 \times b_2^2}\right)\right] + 0.75$$

This derivative may be equated to zero, and the resulting equation solved by trial. The process is rather a tedious one, as it requires, as a preliminary step, the determination by trial of a number of pairs of values of b_1 and b_2 for which the moment of inertia of the strut has the required value.

The values which give the minimum value of W_e in this problem are:

$$b_1 = 1.87 \text{ in.} \quad l_1 = 6.55 \text{ in.}$$
$$b_2 = 1.49 \text{ in.} \quad l_2 = 6.17 \text{ in.}$$

and the value of W_e for this best strut is 1.85, about 6 per cent better than the best obtainable when the form of the hollowed-out portion is geometrically similar to the exterior outline. The form of strut arrived at is shown in Fig. 3 for comparison with the form originally derived and illustrated in Fig. 2.

The complete analysis for the case of constant wall thickness is too tedious to be carried through as a regular feature of strut design. It will be noticed, however, that the value of b, obtained by this method, is very closely equal to that found by the simpler analysis, and the latter can be run through in ten minutes for any size of strut or speed of flight, once the general properties of the section employed are known.

The procedure to be followed in estimating approximately the best dimensions for a hollow strut may then be summarized as follows:

1. Determine the best dimensions on the assumption of geometrically similar inside and outside outlines, in accordance with the method developed in the first part of this article.

2. Using the outside dimensions obtained in (1), find by trial the inside diameter which gives the required moment of inertia when the wall thickness is constant. The constant wall thickness required will, in general, be approximately equal to the minimum wall thickness $\left(\frac{b_1 - b_2}{2}\right)$ determined in (1), multiplied by the fourth root of the fineness ratio of the section.

In conclusion, and in recapitulation, the merits of hollow wooden struts on large airplanes of low or moderate speed, and of tubular steel ones on very fast machines of any size, may be urged with emphasis. The saving in "equivalent weight" and in power consumption more than justifies the added cost of construction.

Fahrenheit-Centigrade Thermometer Scales Compared

F.	C.	F.	C.	F.	C.	F.	C.	F.	C.	F.	C.	F.	C.	F.	C.	F.	C.	F.	C.	F.	C.
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
212	100	185	85.0	158	70.0	131	55.0	104	40.0	77	25.0	50	10.0	23	−5.0	−3	−19.4	−30	−34.4
211	99.4	184	84.4	157	69.4	130	54.4	103	39.4	76	24.4	49	9.4	22	−5.6	−4	−20.0	−31	−35.0
210	98.9	183	83.9	156	68.9	129	53.9	102	38.9	75	23.9	48	8.9	21	−6.1	−5	−20.6	−32	−35.6
209	98.3	182	83.3	155	68.3	128	53.3	101	38.3	74	23.3	47	8.3	20	−6.7	−6	−21.1	−33	−36.1
208	97.8	181	82.8	154	67.8	127	52.8	100	37.8	73	22.8	46	7.8	19	−7.2	−7	−21.7	−34	−36.7
207	97.2	180	82.2	153	67.2	126	52.2	99	37.2	72	22.2	45	7.2	18	−7.8	−8	−22.2	−35	−37.2
206	96.7	179	81.7	152	66.7	125	51.7	98	36.7	71	21.7	44	6.7	17	−8.3	−9	−22.8	−36	−37.8
205	96.1	178	81.1	151	66.1	124	51.1	97	36.1	70	21.1	43	6.1	16	−8.9	−10	−23.3	−37	−38.3
204	95.6	177	80.6	150	65.6	123	50.6	96	35.6	69	20.6	42	5.6	15	−9.4	−11	−23.9	−38	−38.9
203	95.0	176	80.0	149	65.0	122	50.0	95	35.0	68	20.0	41	5.0	14	−10.0	−12	−24.4	−39	−39.4
202	94.4	175	79.4	148	64.4	121	49.4	94	34.4	67	19.4	40	4.4	13	−10.6	−13	−25.0	−40	−40.0
201	93.9	174	78.9	147	63.9	120	48.9	93	33.9	66	18.9	39	3.9	12	−11.1	−14	−25.6	−41	−40.6
200	93.3	173	78.3	146	63.3	119	48.3	92	33.3	65	18.3	38	3.3	11	−11.7	−15	−26.1	−42	−41.1
199	92.8	172	77.8	145	62.8	118	47.8	91	32.8	64	17.8	37	2.8	10	−12.2	−16	−26.7	−43	−41.7
198	92.2	171	77.2	144	62.2	117	47.2	90	32.2	63	17.2	36	2.2	9	−12.8	−17	−27.2	−44	−42.2
197	91.7	170	76.7	143	61.7	116	46.7	89	31.7	62	16.7	35	1.7	8	−13.3	−18	−27.8	−45	−42.8
196	91.1	169	76.1	142	61.1	115	46.1	88	31.1	61	16.1	34	1.1	7	−13.9	−19	−28.3	−46	−43.3
195	90.6	168	75.6	141	60.6	114	45.6	87	30.6	60	15.6	33	0.6	6	−14.4	−20	−28.9	−47	−43.9
194	90.0	167	75.0	140	60.0	113	45.0	86	30.0	59	15.0	32	0.0	5	−15.0	−21	−29.4	−48	−44.4
193	89.4	166	74.4	139	59.4	112	44.4	85	29.4	58	14.4	31	−0.6	4	−15.6	−22	−30.0	−49	−45.0
192	88.9	165	73.9	138	58.9	111	43.9	84	28.9	57	13.9	30	−1.1	3	−16.1	−23	−30.6	−50	−45.6
191	88.3	164	73.3	137	58.3	110	43.3	83	28.3	56	13.3	29	−1.7	2	−16.7	−24	−31.1	−51	−46.1
190	87.8	163	72.8	136	57.8	109	42.8	82	27.8	55	12.8	28	−2.2	1	−17.2	−25	−31.7	−52	−46.7
189	87.2	162	72.2	135	57.2	108	42.2	81	27.2	54	12.2	27	−2.8	0	−17.8	−26	−32.2	−53	−47.2
188	86.7	161	71.7	134	56.7	107	41.7	80	26.7	53	11.7	26	−3.3	−1	−18.3	−27	−32.8	−54	−47.8
187	86.1	160	71.1	133	56.1	106	41.1	79	26.1	52	11.1	25	−3.9	−2	−18.9	−28	−33.3	−55	−48.3
186	85.6	159	70.6	132	55.6	105	40.6	78	25.6	51	10.6	24	−4.4	....	.....	−29	−33.9	....	.....

Engine Rating Formulae

Editor AUTOMOTIVE INDUSTRIES:

IT was in October, 1916, that I asked the Editor of THE AUTOMOBILE whether anything had been done to bring about the adoption of a horsepower rating based on piston displacement. "Practical Engine Rating" was subsequently written by Edward G. Ingram, who has re-written part of this interesting discussion in AUTOMOTIVE INDUSTRIES of Dec. 4, 1919.

In AUTOMOTIVE INDUSTRIES for Nov. 13, 1919, P. M. Heldt develops piston displacement formulae from mean effective pressures. His results for passenger car and truck engines are practically the same as the rating I proposed in AUTOMOTIVE INDUSTRIES Oct. 9, 1919, which was P. D./10=H. P.

In the Dec. 4, 1919 issue, John Jay Ide states that my P. D./10 rating is too complete because it contains π (3.1416). I think this is very little to worry over, for the large majority of manufacturers state in their catalog the piston displacement of the engines they use and, if a piston displacement rating were adopted, they would all list the piston displacement of each engine they manufacture or use. It is easy enough to divide this figure by 10 to obtain rated horsepower.

It is quite true, Mr. Ide states, that the N. A. C. C. rating at least possesses the merit of simplicity. Nevertheless I maintain that it is absurd because, by its use, all engines of a similar bore are rated and taxed the same, regardless of piston displacement.

The speed of 1000 r.p.m., on which I based my rating of P. D./10=H. P. was not assumed but was chosen for the following reasons:

1. It is the speed, I believe, at which the horsepower of engines varies the least.
2. It is probably the most used speed of passenger car engines, corresponding to car speeds of 20 to 25 m.p.h.
3. It might be considered as the average speed of truck engines.
4. It is the speed at which the horsepower developed is approximately one-half of the maximum.
5. A horsepower formula, when used for tax rating, should not indicate the maximum power, when this maximum is seldom used.

As Mr. Ide points out, the rating P. D./10=H. P. consistently under-rates the actual power of all the engines listed in my Table II but is not that more desirable than to over-rate some of them?

Although Mr. Ide did not mention the fact, the rating he submitted, namely, H. P.=B^2SN, is precisely the Denby-Marshall formula, which I must say was unknown to me when I proposed the H.P.=P.D./10 rating. However, the Denby-Marshall formula is also a piston displacement rating. It is equivalent to P.D./9.42=H.P.

Mr. Ide criticized my choosing 1000 r.p.m. for the H. P. =P. D./10 rating and later on he states that he assumed 1000 r.p.m. for the H. P.=$B^2SN/12$. How could he have assumed any other speed when the Denby-Marshall formula is based on 1000 r.p.m.

The formula, H. P.=$B^2SNR/12{,}000$ suggested by Mr. Ide, would not be suitable for high speeds because it will considerably over-rate most engines. For example, according to the above formula, a 3½ x 5-in., 4-cylinder engine would be rated at 49 hp. at 2400 r.p.m. and a 4 x 6-in. four would rate 77 hp. at 2400 r.p.m. At 3000 r.p.m. they would rate at 61 hp. and 96 hp. respectively. Engines can be designed to perform as well as this at 2400 and 3000 r.p.m. but such performance certainly does not represent the average.

RALPH C. CHESNUTT.

Theory of Third Brush Regulation

Editor AUTOMOTIVE INDUSTRIES:

As an appreciative and regular reader of AUTOMOTIVE INDUSTRIES, I have gathered up courage to write you regarding a subject of great interest to me and (I believe) many others.

I am, and have been since its inception, engaged in auto electric service work and have given the subject a good deal of study.

Having superintended the repair and testing of all makes and types of automobile generators, I have been impressed of late with the peculiarities of the third brush controlled generator. I have worked out my own theory of third brush regulation, which is fairly satisfactory, but I do not find in any of the available so-called text books and service manuals an adequate explanation of the subject. Any of the above sources of information that touch on the subject at all do so in a very casual way and make no attempt to give a comprehensive analysis of the subject. AUTOMOTIVE INDUSTRIES has handled the subject in a similar manner to that mentioned above in its Forum section. That type of explanation is undoubtedly good enough for the layman, but we men specializing in this branch of the industry desire something more. We believe that AUTOMOTIVE INDUSTRIES can supply us with the information we wish.

In view of excellent series of articles on the theory of the magneto recently published, I have taken the privilege of writing to you on this subject. The information I especially desire is:

First: Why does the output of generator drop off as speed is increased above a definite point?

Second: What relation has the setting of the main generator brushes to the control and output curve of a third brush generator?

Third: Why will not the output of some generators return to maximum value when the speed of the generator that has been driven at excessive speed not reduce to the speed at which the maximum output was first reached?

C. C. C.

[We shall be glad to consider articles on the subject of the theory of third brush regulation, covering the points mentioned by our correspondent, from writers competent in this branch of automotive engineering.—*Editor.*]

THE article on "Tangential Cams," published in the issue of Feb. 5, should have been signed by Ralph M. Gaston, a frequent contributor to this publication.

Better Instruction and Service Books Are Needed

Service is so closely linked with sales that to-day no manufacturer would think of marketing his car without provisions for service. But manufacturers generally appear to have overlooked this immense field for service. Mr. Pile's article was written after he had reviewed the instruction books of practically all leading vehicle makers. The good ones were scarce.

By J. Howard Pile*

THE instruction book that accompanies the new car, truck or tractor, has a distinct mission to perform, and that mission is to assist in keeping the vehicle in good running condition. How the manufacturer ever expects the owner to do this, is, in some cases, a profound mystery. Some of the instruction books are combined with parts price lists and the entire subject of operation and maintenance is condensed into a couple of pages, which is then followed or preceded by a copy of the "Standard Warranty" and detailed instructions as to how to ship defective parts back to the factory.

Not only is such an instruction book almost valueless, but it must certainly produce an effect on the mind of the purchaser which is far from what the sales department would desire. The book tells all the things the company will not do and then graciously gives about three cents' worth of instructions.

Then there is the swing to the other side; the instruction book that has so much information in it that the layman has difficulty in finding the thing he is looking for, and such operations as require a considerable degree of skill are detailed at length. If the layman owner reads this matter, he may feel that he is competent to do the work himself and may get himself into trouble.

A strong evidence that not enough care is spent in the preparation of these books is the fact that such subjects as ignition, carbureters, storage batteries, etc., are generally very well covered for the simple reason that these parts makers have themselves prepared good instruction books and the car makers have simply appropriated all this material and then given scant attention to those parts whose makers have not been thoughtful enough to get up their own instructions.

Instruction books could be made more useful and could materially assist in keeping the vehicles in good running order by giving some thought to the man that reads them. The owners of passenger cars run all the way from the man who does not know there is an engine under the hood to the man who is mechanically inclined and who is able to make most of the minor repairs on his car. An instruction book for the passenger-car owner, to meet the requirements of these variations, should contain complete driving instructions, lubrication charts and directions, notes on the general care of the car and details of minor adjustments that the owner could make to keep it running right. Such operations as scraping bearings, lapping cylinders, and adjusting driving gears, have no place in such a book, yet they are often included and tend only to becloud the rest of the material.

A repair manual for the service station and garage should contain detailed instructions for the repair and overhaul of every part of the car. There is no good reason why copies of this repair manual should be kept out of the owner's hands if he wants it, but it should be given to owners only on request. If the garage and repairshop called upon to make repairs and adjustments to cars is without a repair manual of any kind, the job may be a poor one, with resulting dissatisfaction on the part of the shop that did the repairing, the owner who had to pay for the poor job, and the car maker, who suffers a certain loss in reputation from a poor running car.

A conspicuous example of what should be done is the manuals now issued by the Willys-Overland Co., on the new Overland Four. There is an instruction book for owners and a repair manual for the shop. The latter not only gives detailed instructions in 1, 2, 3 order, but also gives average time limits for every job and the division of the material into these two classes marks a decided step in the right direction. It is to be hoped that other makers will follow the lead taken by Overland.

Wiring diagrams are included in most of the instruction books and some of these are worse than useless. The owner, as a rule, cannot read the diagrams, as they are in "technical drawing." On the other hand, they are not complete enough for the repairman, because they do not show all the internal circuits, nor do they show all the connections. Frequently there are several diagrams in one book referring to different models and the owner must decide which diagram is the right one. Wiring diagrams, intended for car owners, should be drawn in perspective, so that he can see just where the wires go. Lines, jumpers and symbols are useless.

Truck instruction books, on the other hand, must be more complete. The driver is at all times on his toes to keep the truck going and, if any difficulty arises that he does not know how to take care of and the instruction book is silent on that thing, he is up against it and must send for help. There are many difficulties that trucks get into from which passenger cars are free. For instance, in the matter of driving chains, it is not in our recollection that any truck instruction book tells how to get the truck out of a car track when one of the chains slips off or breaks, yet the streets of big cities, time after time are clogged up for minutes and hours because nobody knows what to do. Some chap who knows tells them what to do, and in a minute the truck is out of the way. This is just an instance of what is lacking.

Tractor instruction books offer a still different problem. Trucks and passenger cars are usually within reach of a

* Of Motor World.

repairshop in case of serious trouble, but the tractor is generally miles out in the country and cannot get to the repairshop if there is one. Instruction books for tractors should therefore cover every possible trouble that would be encountered and the owner should be told how to perform every operation from draining the carbureter to scraping in a set of bearings. Copious illustrations should be used in the reading matter so that there can be no possible mistake. All bearing tolerances should be given, valve tappet tolerances, guide marks, timing instructions, etc. Such a book cannot be too complete.

It has been said, and quite truthfully, that the automotive industry is like a three-legged stool. The legs might be called

Manufacture
Sales
Service

If any one of these legs is weak, the stool falls down, no matter how strong the other two legs may be. Instruction books come under the heading of service, because they assist in keeping the vehicle in operation. Not all service is performed at the shop or the service station. By far the most important parts of service are those little things that the owner does to keep the car on the go—such as screwing down grease cups, setting nuts tight, filling the battery with water and keeping the radiator filled. If it is possible to educate the owner to do these things, do them correctly and do them regularly, shop service will be reduced to a minimum because the only reason for coming to the shop will be from accident or natural wear. The big bulk of the work in the service station is the result of carelessness on the part of the owner. To reduce this carelessness—BETTER INSTRUCTION BOOKS.

American Engineering Standards Committee Constitution

AFTER almost three years of preliminary work the revised constitution of the American Engineering Standards Committee, along with the by-laws and rules of procedure, has been adopted and has been ratified by the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Society for Testing Materials, and the three government departments of Commerce, Navy and War. Each of these interests has three representatives on the committee, making a total of 24 members.

On account of the press of other affairs, Professor Adams has given up the chairmanship. A. A. Stevenson, the newly-elected chairman, is a former president of the American Society for Testing Materials, and has been interested in standardization work for many years. C. B. LePage, who acted as secretary during the organization period, was unable to continue the work and has resigned. Dr. P. G. Agnew, formerly of the United States Bureau of Standards, is now permanent secretary, with headquarters at the Engineering Societies Building, 29 West Thirty-ninth Street, New York.

The American Engineering Standards Committee makes it possible to give an international status to American engineering standards and to cooperate with similar organizations in other countries. Similar organizations are now functioning in Great Britain, France, Switzerland, Holland and Canada.

Through the new committee, the methods of arriving at engineering standards will be unified and simplified and, by cooperation, the duplication of standardization work will be prevented. Standards will not be created without giving all interested an opportunity to participate. The "approval" of a standard by the American Engineering Standards Committee does not mean that the committee has itself worked over and approved each detail. It does signify, however, that the work has been carried out by a sectional committee adequately representing the industry concerned and sponsored by one or more bodies of ability, experience and standing, so that the result may stand for what is best in American engineering practice.

So far the committee has approved specifications for standard pipe threads, for which the American Society of Mechanical Engineers and the American Gas Association are sponsors, and is representing America on this subject at an international conference in Paris. Cooperation is in progress with the National Screw Thread Commission, authorized by Congress and composed of representatives of the various technical societies. Through this arrangement, direct cooperative work with the British, which is not possible by the official Commission, is being carried out. The committee also is in active cooperation with the Canadians on bridge specifications, with the British on specifications for machine tools, and with the Swiss on specifications for ball bearings. In each case the detail work is being carried out by sponsor bodies through sectional committees.

A conference participated in by many national organizations interested in industrial safety, has voted that all industrial safety codes be prepared under the auspices of the American Engineering Standards Committee.

Any organization may request the committee to approve standards which it has formulated or to approve committees that it has appointed and by so doing becomes a sponsor society. Two or more organizations may act as joint sponsors. Approval of a standard is given when it is the substantially unanimous conclusion of a section committee made up of representatives of producers, consumers and general interests and so selected that all interests concerned have adequate representation on the section committee.

It is understood that a standard must be referred to as that of the sponsor, using whatever title the sponsor has given it, followed by the statement, "Approved by the American Engineering Standards Committee." The approval may be given in one of three ways: "Recommended Practice," "Tentative Standard" or "American Standard."

In addition to its assistance in the selection of committees and certifying that their work has been done under proper conditions, the committee will act as a bureau of information regarding standardization. It will collect information regarding existing standards and as to the bodies that have formulated or adopted them. This will enable it properly to give the data to those who select a committee to formulate a new standard or revise an old one.

Provision is made for direct representation on the American Engineering Standards Committee, of additional organizations (or groups of organizations) interested in engineering standardization.

Effects of the Disagreeable Job on the Production Curve

Several factors relate to the size of the labor turnover in any plant. Mr. Tipper emphasizes here that these things have a wide influence in keeping high the factory output and asks for a more intelligent understanding.

By Harry Tipper

LAST week I was talking with a man who had visited a number of foundries probably for the first time in his life. One of his comments was significant, although he may not have recognized the fact. He said, "practically all the foundries I went to seemed to me full of smoke and dirt. Of course, I don't understand the technique, and the operations were confusing to me, so that the disagreeable character of the atmosphere and the depressing surroundings were in my mind. But I do not believe I would want to operate a foundry if I had to work in it, no matter how much money I made."

"Well," I said, "perhaps some of the workmen dislike the disagreeable surroundings just as you do. Of course, they are not so sensitive and, of course, they have not had the opportunity to make money in pleasanter occupations and, of course, they are to some extent accustomed to it. But human reactions are much alike, and it is hardly likely that these workers really enjoy the disagreeable conditions."

Undoubtedly this same thought was in Mr. Bullard's mind when he admitted that he could not get the turnover in the foundry down to the same degree as the machine shop, and at the time we had our conversation about it, Mr. Bullard stated he felt pretty sure that the disagreeable character of the work had something to do with it.

Two or three business men who operate with a large number of employees have suggested that it may be necessary for us to pay a man for disagreeable surroundings in his work, just as we pay him for skill.

The point which comes out of these casual statements is not merely the effect of the character and surroundings of the work as one factor in the lack of incentive among the workers, but the fact that the average business man does not go far enough to find out that the workers are animated by sentiments of much the same character as those animating the executive. It is true that they are not so thoroughly developed and they do not find expression as easily. Perhaps they do not realize them. Their actions, however, are not governed by their thoughts, but by their feelings, and their feelings, in a broad way, are similar, varying only in degrees of development.

A good many of our difficulties in understanding the viewpoint of the worker arise from the neglect of this similarity in feeling and the consequent reaction which comes out of it. Just because there is a lot of disagreeable work to be done does not mean that the worker likes to do it and wishes to remain at that work. All the evidence shows that he escapes from it as often and as regularly as he can and that, while confined to that work, he constantly moves about in the hope of bettering the conditions.

As a friend of mine said to me the other day, "if I just go to a restaurant to eat, I am sure to get tired of it in a week or two and go to some other place. Not that I really expect any improvement, but I want a change in a way, and there is always some hope that things will be a little better in the new place. Unless there is something more than food and eating, nothing can hold me to one place. I have had lots of worse food with some of the cooks we have been obliged to put up with at home, but I enjoy it more and, as a matter of fact, my digestion is better."

Something of the same character creeps into a man's attitude toward his work. Where there is no particular and valuable object in the work and it is just work, he is apt to get tired of the familiar surroundings and try a new place. Where there is no endeavor to respect his individuality and acknowledge it, so that he feels that he is identified as an individual, and where there is no personal relationship to the organization, his attitude is much the same as the man's attitude toward the restaurant spoken about.

The same attitude developed, not by the disagreeable character but by the lack of object in a job, is indicated by the little story told to me the other day by a manufacturer of prominence in the metal trades field. He said that they had hired an Italian to go to work in the factory. As a matter of fact the man had been anxious to start there and so they had hired him for one of the minor jobs where the turnover is somewhat large. After he had gone through the employment department and the other preliminaries, the foreman showed him his job. That particular job was to shovel scrap from a pile into a wheelbarrow and dump it on another pile. The man looked at the job and said in his broken English, "I like to work here but not that job, no good."

As a matter of fact, when you come to think of it, his estimate of the job was pretty correct; any intelligent man would escape from such a job just about as fast as he could accumulate sufficient skill to do something else. Stories of this kind could be multiplied a hundred times. They exist in every department of every factory, and the personal impressions of every man who has to see many manufacturing operations include a good many, but they pass without thought and are not supposed to be of any importance in their reflection upon production.

This is the primary mistake. Because they do not relate to mathematics, to the operation of machines, to the relation of equipment and to those other tangible elements which are dubbed practical, they are

not supposed to count. We call a man a fool because he won't work at what he can do, we call him a floater because he doesn't stick at one job, and we call him a trouble-maker because he is not satisfied, without in the least understanding that these few incidents which come to our notice are only the surface indications of a widespread condition which enlarges our turnover, decreases the production toward the minimum and affects the attitude of the man toward industry. Some day we shall know enough about the effects of these things to make it possible for an expert statistician to calculate how much it costs industry per year to neglect such matters.

Sometimes, indeed, we refuse to see in the instances of individual reaction like this any possibility of a general condition. I should hate to be obliged to count up the number of times that executives have told me: "That's an individual case. Every individual case is different, and you can't provide any general rules therefrom." Perhaps so, but the statement is not conclusive. Insurance actuaries do not know when you and I are due to shuffle off this mortal soil, but they do know how many of us will die between certain ages, with sufficient accuracy to enable the insurance company to build hundreds of millions of dollars worth of business upon those conclusions. The same thing is true of fire and of theft and other items of insurance aimed to provide against the failure of the individual.

In the same way, it is possible to measure from the individual reaction toward work, some of the things which make for careless workmanship, minimum production rates, maximum turnover, suspicion of employer and other items costly to industry. An executive who has been conspicuous for the success of his attempts to educate his workmen to a spirit of appreciation of the organization policy made the statement to me not long ago: "I have learned never to let a casual remark go by." AND THIS AGREES very thoroughly with the statement made to me some years ago by a public man who was noted for his understanding of human nature: "It is the casual or unconscious statement or action which betrays the real feeling. The deliberate statement or action is too calculated to permit it."

There are four factors which relate to a man's incentive to work and remain at work that are fully determined by our present knowledge and which, in their reaction, have a direct bearing upon the amount and cost of production. These factors are:

1st: The character of the object of the work.
2nd: The character of the surroundings.
3rd: The opportunity for individual expression or skill.
4th: The reward.

The instances which have been mentioned are culled from hundreds that have been brought to my attention simply to suggest the way in which they find expression from time to time.

By examining these hundreds of individual cases in their relation to one and another, it is possible to see that one or more of the four factors mentioned above are indicated in each individual case. They differ only in the individual expression of the matter and not in the reaction revealed. They can be gathered together as thoroughly as the actuary gathers his mortality statistics and with almost as much precision.

It is not possible as yet to state in money the effect they have upon production amount and cost, because their influence is not so definite and ranges through a larger number of degrees of power. But they are always at work and show themselves in the rate of turnover, the increasing difficulty of securing labor for some classes of work, the continual establishment of minimum rates of production and the general dissatisfaction with present industrial organization.

Increasing the Rate of Pay

THE Packard Motor Car Co. is one of the automobile firms, at least, that believes in the efficacy of unsolicited raises as a sincere means of keeping men contented and interested in their work. To carry out the idea in practice it has worked out a practical and successful system of efficiency records under the supervision of the employment department.

These records, which are kept by the rate man of the employment department, relate to every phase of the employee's work. They include his production efficiency, his absences, his lateness, etc. Such a record is kept for every shop employee of the company. It is on the basis of this record that the employee's rate is raised, but a raise is never granted without a consultation with the foreman of the man's department.

Every man is due for a raise at certain stated intervals if his record shows that he is entitled to it. When the time for a certain man's raise is due, the rate man and the foreman get together. The foreman has a general knowledge of the man's ability and working capacity, while the rate man supplies an accurate record of what the man actually has done. Between the two of them, it is decided to give or withhold the raise. While this power of rate adjustment lies ultimately in the hands of the employment department, no case has yet arisen where the final decision was not reached in agreement with the foreman.

This is considered an essential part of the system, since it would be detrimental to the morale of the working force if a man were to feel that he owed no obligations to his foreman; that it was not really necessary for him to "make good" with his foreman. That the plan has worked out successfully is, of course, due to the ability of the employment department to gain the co-operation of the foremen in their efforts to do justice to both the men and the company.

Very often the facts of the record will change a hastily formed opinion of a foreman, who may, quite honestly, have based his judgment on a general impression. It is advantageous to the foreman, because it enables him to know absolutely the record of his men in a way that his general supervision of their work would never permit, and it relieves him of the responsibility of being accused of favoritism or unfairness.

When the records show that a man is not, in the opinion of the employment department and the foreman, entitled to a raise when, in the normal course of events, he should be, that man is either called to the employment department for a conference with the rate man or with the foreman. The record is shown to the man and the reasons for his failure to receive a raise are explained. Frequently the facts of his record surprise the man himself.

This plan has the effect of letting the workman know that his individual efforts are being watched and appreciated, and that the company considers him an important unit in the organization.

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Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly), July, 1907, and The Horseless Age (semi-monthly) May, 1918.

Our Forthcoming Engineering Number

ON June 10 next, we will publish our annual Engineering Number, devoted to the progress of the year and to late practice generally in automotive and allied branches of engineering. We hope to make this a better and more valuable issue than last year's Engineering Number, which was greatly appreciated by the profession, and are making preparations to secure suitable articles from widely different quarters.

Any of our readers who have material suitable for publication in this issue are requested to communicate with us at once. We expect to cover all branches of automotive engineering, including the automobile, truck, tractor, motorcycle, aircraft and marine fields, and may also have something on isolated lighting plants and other small stationary power installations. Materials used in automotive engineering, and their treatment, will also be covered. Whatever matter is accepted will be paid for at liberal rates. It will be carefully edited and, when appearing in the Engineering Number of AUTOMOTIVE INDUSTRIES, it will come to the attention of a large number of readers interested in this class of literature.

All articles and illustrations intended for the Engineering Number should be in our office by May 15.

The Large Tractor

PRACTICALLY all the tractor engineering progress of the past several years has been confined to tractors of small and moderate size, the 4-plow tractor being the largest type that has shown any tendency to become modernized. It is generally realized that the big demand in the future will be for tractors of 2- to 4-plow capacity, yet at each succeeding show we see large machines pulling up to 10 plows, and in considerable numbers. As show space is expensive, it can only be concluded that there is still quite a demand for these big tractors. Inquiries among the manufacturers show that such machines meet with a steady sale, for use in road building, on large farms, etc.

As compared with the up-to-date 3-plow tractor, the big machines are crude and relatively inefficient. Much of the engineering effort expended on tractors recently has been with the object of reducing weight, so as to eliminate some of the loss incident to moving the tractor itself over the field. It is generally believed that the minimum weight limit of a farm tractor depends directly upon the maximum drawbar pull the tractor is expected to exert. A modern 3-plow machine generally weighs about 5000 lb. and will exert a drawbar pull of about 2500 lb., or one-half its own weight. Some of the large tractors, on the other hand, are limited to a maximum drawbar pull at plowing speed equal to only about one-fourth their weight, this in spite of the fact that the speeds of these large tractors are generally somewhat lower.

This method of comparison, based on the weight-drawbar pull ratio, is undoubtedly somewhat crude, because the element of speed is left out of consideration. A better basis would be the weight per drawbar horsepower. The later designs of 3-plow tractors weigh about 350 lb. per drawbar horsepower, but the large 8-10-plow tractors average nearly twice this weight. It is therefore evident that there is much unnecessary weight in these big machines.

In revising the design of the big tractors it is, of course, impossible to follow the lines of the smaller ones in all respects. Owing to the limited demand it is commercially impossible to tool up to the same extent. The backbone style of construction, which has become so popular for the smaller tractor, does not lend itself to the bigger one, because of the tooling difficulty and also because the individual units or castings would be so heavy that they could not be readily handled on the farm. It is, therefore, likely that the large tractor will retain its general form, comprising a structural steel frame upon which the chief components are separately mounted.

Where there is a chance for considerable improvement is in respect to the weight of the whole assembly. It probably will be necessary to increase the engine speed so as to bring the weight of the engine down. This will also permit of a somewhat lighter gearbox

and frame. At present a great deal of weight is stored in the enormous driving wheels, and it seems reasonable to suppose that these can be reduced in diameter without lowering the working efficiency of the tractor. A further point in respect to which the large tractor should be modernized is the use of plain bearings, which should be replaced by anti-friction bearings.

There have been no marked changes in design in large tractors for some years. Any manufacturer who should bring out a visibly improved type would stand a good chance of reaping the reward which progressiveness deserves.

A Clean Slate

AT a time when the majority of employers throughout this country are doing their utmost to obtain the co-operation and good-will of their workmen, the employer who breaks faith with his employees either directly or indirectly is to be condemned as a menace to industrial peace. With this in mind, the statement of Bernard L. Shientag, counsel to the New York State Industrial Commission, is significant.

Shientag said recently that thousands of employers in New York State fail to carry compensation insurance for their employees, although the law requires them to do so and makes its infringement a misdemeanor. "Since I became counsel to the New York State Industrial Commission," he said, "I have made energetic efforts to secure better compliance with this important provision of the law. Publicity has been resorted to and prosecutions have been instituted."

The importance of this statement lies, not in the mere violation of this particular state law, but in the broader principle underlying industrial relationships. Most employers recognize the fact that the enthusiastic co-operation of their workmen means increased production and better work. In their attempts to gain this co-operation, they are combating the propaganda of radical leaders who find their chief ammunition in actions of employers unfavorable to their workmen. The task of the employer is a difficult one as it is; certainly he should not be hampered in accomplishing it by slackers in his own ranks.

Such facts as those brought out by Shientag are seized upon by every radical in the country and "played up" as additional evidence that the employer is a tyrant and a profit-grabber. In the very nature of the case, such violations of the law become public knowledge; the effort to enforce the law necessitates the use of publicity and prosecutions. The spread of such knowledge creates additional "sore spots" upon which the radical may sprinkle his salt of industrial unrest.

It is unfortunately true that a man is known by the company he keeps and to the radical propagandist an employer is an employer regardless of any distinctions there may be within that class. Every blot of this kind upon the record of any one employer renders more difficult the huge task of other employers in gaining industrial co-operation. For this reason, employers as a group should lend the weight of their opinion against individual members of their group who persist in the violation of petty or major laws and agreements concerning industrial relations.

With a perfectly clean slate on their own side, employers will then be able with far greater force to condemn utterly those all-too-common breaches of faith which occur through the action of labor leaders or organizations.

Patent Office Efficiency

ONE of the important bills before Congress is that providing appropriations for the Patent Office. It would increase the wages of Patent Office employees, particularly for examiners, and, in view of the fact that wages in the Patent Office are substantially the same as they were forty years ago, the bill should be approved by Congress.

The patent examiners are highly trained men and their work is of great importance to industry. A competent and comprehensive force must be maintained at all times. With patent applications increasing beyond all records and the examiners resigning in large numbers because of their inability to live on their present salaries, the operations of the department are reaching a chaotic state.

Eighty-one of the 431 examiners resigned in 1919 because of low salaries. Few men can be attracted to the training corps for that service. Practically none can be attracted who possess the requisite qualifications for examiners, because of the low salaries.

These men are receiving salaries of $2,740, including the bonus, and several of these have been offered $4,500 a year in the commercial world. Likewise the first, second, third and fourth assistant examiners are receiving salaries 50 per cent lower than they can secure in industry. At the same time applications for inventions in 1919 totaled 76,484, as compared with 57,180 in 1918, and trademarks, labels, prints, copies of patents sold, etc., increased in like proportions.

The Patent Office is too important to industry to allow it to suffer, especially so when the present salaries are unjust and unfair to its workers.

Stock Variations

ONE of the worst features of the overcrowded condition of foundries and forge shops is the variation in physical characteristics of the stock furnished the machines in our plants to-day. Not only does it render difficult the proper setting of time limits on machine operations, but it is also responsible for a great shortening of the average life of tools.

Castings are particularly prone to vary. Even under the best conditions it is often difficult to hold the hardness of different heats to anything like a constant figure. Under present conditions the variation is tremendous, and the result is that the average shop is continually disturbed in its calculations on feeds and cutting rates. Forgings, which were formerly held to very close limits on the scleroscope, now vary through a wide range. This is just another one of the factors which will hold production down below what it should be this year, and which, incidentally, will considerably increase the tool costs.

Railroads Move to Relieve Car Shortage

American Railroad Association Takes Action Following Conference with A. C. C.

NEW YORK, March 16.—Considerable improvement in the facilities for shipping automobiles is expected as a result of the recent conference of representatives of the National Automobile Chamber of Commerce with the Car Service Commission of the American Railroad Association at Washington.

As a result of this conference a circular has been issued by the commission to all railroads urging that automobile freight cars can be handled in such a manner as to insure the best service obtainable for the automobile shippers.

The circular points out that the period of maximum requirements for automobile loading is at hand, and continues:

"Shortage of automobile cars, particularly during the past few weeks, has resulted in a large accumulation of shipments in producing territories, and in addition, a considerable number of automobiles have been driven away from the factories and are being held in storage awaiting shipment from various points short of destination.

"Automobile cars are badly scattered and must be in possession of the owners to satisfactorily handle the business and to this end it will be very helpful to the general situation if all railroads will particularize with respect to this equipment.

"Local loading of foreign automobile cars, with miscellaneous freight should be avoided where practicable, and generally, until existing shortages have been relieved, railroads should refrain from furnishing this equipment for loading other than that for which automobile cars were constructed.

"Loading of foreign automobile cars with miscellaneous freight, where necessary, should be in direct route to owners or to automobile manufacturing territory but not beyond. Otherwise, and in the absence of automobile loading to owning lines, cars should be sent empty to the car owner under car service rules."

The Commission assured the N. A. C. C. that the effect of this circular on the movement and handling of automobile cars would be carefully noted and, if results were not satisfactory, further steps would be taken to gain control of these cars.

Standard Parts Now Under New Officials

CLEVELAND, March 15—Reorganization of Standard Parts Co. has been completed, and the big organization is functioning as consistently as though nothing had occurred to disturb the equilibrium.

J. O. Eaton, the new president, has surrounded himself with a coterie of experts headed by John Younger as vice-president and assistant general manager, who succeeds J. J. Utz. Younger comes to Standard Parts and brings to the Standard a wide and varied experience as an automotive executive.

D. K. Moore, general manager of the axle plant, is succeeded by C. I. Ochs, who for several years has been associated with President Eaton in the Torbensen Axle Co. and the Republic Truck organization. G. L. Bitting, for several years with the Timken forces in Detroit, succeeds W. B. Fewell as salesmanager of the axle plant. Another important addition to that end of the company is Charles S. Dahlquist, who succeeds L. P. Kalk as chief engineer.

The Industrial Report

The work of the Industrial Conference has just been completed and issued in final form. The Conference report is very much more complete than anything issued by previous bodies of this kind. It has gone further into the question and has dealt with a larger number of questions which are confronting industry in a general way at this time. On the important question of collective bargaining the Conference has taken a very just position in its recognition of the value of employee representation and the encouragement which should be given to this method. It has provided for other machinery of adjustment through national and regional conferences which are somewhat similar in principle to the Whitley proposals in Great Britain. A large part of the report is taken up with the detailed provisions for these conferences and their application to industry, to public utilities and to governmental employees. Some of the statements which are made under hours of labor, child labor, housing, wages and profit sharing are worthy of study. In general, the report does not present anything particularly new, but it reviews very ably the conditions, the experiments which are going on and the necessities of the case, while its suggestions for improvement are sane and orderly.

REO MERGES DEPARTMENTS

LANSING, MICH., March 15—The advertising department of the Reo Motor Car Co. has been merged with the sales promotion department and will be under the direction of Walter K. Powers, sales promotion manager. This action was taken following the resignation of F. L. Waite as advertising manager.

AUSTIN STOCK SALES POOR

LONDON, Feb. 27 (*Special correspondence*)—It is understood that the Austin Motor company's new capital issue of $7,500,000 (pre-war rate of exchange) has resulted in 80 per cent being left on the underwriters' hands.

Aluminum Castings Rumors Unfounded

Allyne Denies Stories of Reported Contemplated Changes in Management

CLEVELAND, March 15—Reports of dissatisfaction with the management of the Aluminum Manufactures, Inc., formerly the Aluminum Castings Co. were denounced to-day as enemy propaganda by President E. E. Allyne. Allyne insists the Aluminum Co. of America, holding corporation for Aluminum Manufactures, is highly satisfied with the conduct of the affairs of the company over which he has control, and declared statements to the contrary had their origin among disgruntled persons, personally antagonistic to him and in some cases influenced in their attitude by connection with rival companies.

Contradicting the statement that the company had not made money for two years, President Allyne said the company made money during the war, but, like a great many others, did not make money during 1919, chiefly because of the fact of the transition from war to peace work. Aluminum Castings was on a basis of 100 per cent war work up to the time of the armistice and for some time thereafter. Allyne used the short and ugly word in denouncing the report as to the failure of the company to make money, and was equally vehement in expressing himself with regard to the report that the company was not meeting its obligations promptly.

The reports of disaffection in the organization began to be circulated last fall, and a refinancing program engineered by the Aluminum Co. of America, which took over the controlling interest in the stock, appeared to lend color to the rumors. Under the reorganization the company issued $5,000,000 in preferred stock and 400,000 shares of no par common.

Refinancing Done by Allyne

Allyne declared he engineered the refinancing details, and said he had at all times and still does enjoy the full confidence of the parent company. With regard to the appointment of George Stanley, an official of the Aluminum Co. of America, as vice-president and treasurer of the Aluminum Manufactures, Inc., Allyne said Stanley was brought into the organization at his request to take over the duties of J. J. McCashen, who had resigned.

"The company now is making money, and undergoing expansion that will greatly increase the business," said Allyne. "Under the circumstances, it readily can be seen that reports of dissatisfaction have little basis in fact. If the company were being operated at a loss, or if it were not returning the revenue deemed sufficient by the directors, there might be ground for such rumors. Conditions are such, however, that to any one conversant with the company's affairs such reports are ridiculous."

N.A.C.C. Tells Need of Research Work

Senate Told of Importance of Gasoline Studies to Automotive Industry

NEW YORK, March 15—The National Automobile Chamber of Commerce has asked the Senate Appropriations Committee to retain in the Appropriations Bill the item of $250,000 for expenditure in industrial research in the work of the Bureau of Standards at Washington. It is understood that this item has been reduced to $50,000.

In asking that the item remain, the chamber has pointed out that during the past ten years the production of crude oil has increased 95 per cent, the production of gasoline 560 per cent and the production of automobiles 1700 per cent. In 1919, which was an abnormally low year, from a standpoint of consumption, there was only a very slight margin between the production of gasoline and its consumption in the United States. In 1920, with no new fields in sight and a rapidly increasing use of gasoline, due to a number of different factors, it appears that the consumption will exceed the production.

The chamber points out that there are two ways in which this situation may be relieved in so far as the automobile industry is concerned: first, by research work which will give us more efficient fuel used by gasoline engines, and, second, an educational campaign which will teach the users of gasoline how to obtain the best results from their fuel. The chamber points out that the research work mentioned is now being carried out by the Automotive Section of the Bureau of Standards, and it believes that the results which may be obtained are of the utmost importance to the people of the United States.

Trade Opportunities in Foreign Markets

WASHINGTON, March 15 — The Bureau of Foreign & Domestic Commerce, Department of Commerce, has received requests for automobiles or parts agencies of business from individuals and companies in foreign countries. These are listed below. For further information address the Bureau of Foreign & Domestic Commerce and specify the Foreign Trade Opportunity Number.

A firm in France desires to purchase and secure an agency for automobiles, motorcycles and accessories. Quotations should be given c.i.f. French port. Correspondence should be in French. Reference. 32216.

A general import representative in Italy desires to secure an agency or purchase aeronautic materials. Correspondence may be in English. References. 32221.

A merchant firm in Scotland desires to purchase motorcycles in large quantities, and would also like to receive a copy of a motorcycle trade paper. Quotations should be given c.i.f. port in Scotland or f.o.b. Atlantic port. References. 32233.

A general agency firm in South Africa desires to secure the representation of manufacturers and shippers of automobiles and motorcycles. Reference. 32241.

A firm of importers in New Zealand desires to secure an agency for the sale of motor cars, farm tractors and motor trucks. Payment through bank in New York. References. 32261.

A manufacturer in South Africa desires to purchase motor cars and motor accessories. Quotations should be given f.o.b. New York. Payment through bank against documents. Reference. 32262.

N. I. & V. A. Approves "Cash Basis Now" Plan

NEW YORK, March 16—"The time has come to put the implement industry more nearly on a cash basis."

This statement is made in a letter submitted by George N. Peek, chairman of the terms committee, National Implement and Vehicle Association, to the executive committee of the association. The sentiments contained in this letter have the hearty indorsement of the executive committee, which has authorized its distribution among members of the N. I. and V. A.

This letter presents a review of the terms situation in the industry, comparing them with those of the automobile industry. Particular attention is called to "Finance-Acceptance" or "Credit Companies" which are made use of by the automobile manufacturers to aid in keeping the automobile industry on a cash basis.

The terms committee takes the view that the local banks should finance the needs of the local community rather than these outside organizations.

S. A. E. Sets Date for Summer Conference

NEW YORK, March 17—The 1920 summer meeting of the Society of Automotive Engineers will be held at Ottawa Beach, Mich., June 21 to 25, inclusive.

The program, which has been worked out in considerable detail, promises one of the best sessions ever held by the engineers.

The first day will be devoted to the standards committee meetings. The arrangements for the four succeeding days provide for technical sessions in the mornings, recreation and sports afternoons, and one-hour lectures in the evenings on timely topics.

FORD BORDEAUX SHOP BURNED

PARIS, March 1 (*Special Correspondence*)—The body assembly shops of the Ford Motor company at Bordeaux have been completely destroyed by fire.

This will delay the delivery of finished cars, but will not in any way affect the erection of chassis. The Bordeaux factory of the Ford Co. is for assembly only.

Handley-Page Lines May Cross America

British Designer, Visiting America, Has Plans for Mail and Express Lines

CLEVELAND, March 17 — Frederick Handley Page, the British airplane engineer and builder, predicted here that marked improvement in plane design and increased efficiency will reduce the cost of air transport to that of express trains. Page has been here for two days visiting the plants of the Glenn L. Martin and the White companies. He arrived at New York on the steamer Mauretania on March 13 and came at once to Cleveland. He went from here to Chicago.

"The limit of airplane development was by no means reached during the war," he said. "So far, it has been enormous, but I look for great future development. There was an intense demand for production during the war and activities were concentrated on immediate necessities. The wartime development was in the way of improving machines already designed by increasing their size, making them lighter and increasing their power.

"Engine design has reached a high state as a result of the military effort by aircraft and automobile builders. But I expect the future will bring great improvements in air dynamics. Machines will be constructed with much less head resistance.

"We have designed a plane that has twice as much lift as before. That improvement means more efficient machines and cheaper air transport. Great attention is being given to the matter of air routes and to provisions for airdromes and better weather forecasts. Airdromes are as necessary for the operation of aircraft as docks for ocean liners.

"Airplanes will be built requiring less horsepower for a given load. Our new type machine is equipped with two 450-hp. engines capable of carrying 3500 lb., the plane having a total lift of 12,000 lb. It has a top speed of 115 m.p.h., a cruising speed of 105 m.p.h. and will make a non-stop flight of 500 to 600 miles. But I expect the same machine will be improved until, with a total of only 300 hp. it will have the same lift but its carrying capacity will be increased to 4000 lb."

Page stated that he was visiting America to see how work is done in automobile and aircraft plants.

Seeks Interview on Express Matter

NEW YORK, March 16—Before leaving here for Cleveland, Frederick Handley Page made efforts to see R. E. M. Cowie, the vice-president of the American Railway Express Co., who has stated that his company would contract for cargo space on a reliable aerial line operating between New York and Chicago. Cowie, however, was ill and so did not see him. The purpose of the interview was not disclosed.

New Type Engines Must Solve Gasoline Problem, Says Expert

Though Supplies Are Ample for Many Years, Increased Demands Will Cause Prices to Become Serious Matter, Bureau of Mines Official Declares

WASHINGTON, March 13—With production of gasoline rapidly approaching a maximum limit and the numbers of automobiles in this country increasing at the rate of 1,500,000 a year, combined with a growing demand for fuel oil for marine purposes, a possible gasoline famine or at least an important increase in the price of gasoline offers a serious problem, according to N. A. C. Smith of the Bureau of Mines, Department of Interior. This problem, he continues, may be solved by the judicious use of fuel oil, which constitutes over 50 per cent of the products obtained from crude oil refined in this country, and which, if used in engines of the Diesel type and as a method of raising steam under boilers, would be more profitable.

"If engineers are able to design an automobile or truck engine," states Smith, "that will use fuel oil in a satisfactory manner, they will relieve the danger of the impending shortage and make possible the desirable extension of the use of the automobile and truck."

"The last ten years," declared Smith, "have seen an enormous increase in the demand for petroleum products. This increased demand has been felt in all phases of the oil refining industry, especially in the fuel, illuminating and lubricating oil branches. The biggest increase of all, however, has been in the demand for motor gasoline, which has been caused by the tremendously rapid growth in the use of the automobile. The number of cars and trucks in service increased about 1700 per cent from 1909 to 1918. The production of gasoline to meet this demand increased from 13,000,000 bbl. in 1909 to 85,000,000 bbl. in 1918, a gain of 560 per cent. During the same period the production of crude oil in the United States increased only 95 per cent.

Demand Far Outgrows Production

"It will be noted that the demand for gasoline, represented by the number of automobiles and trucks in use, has increased a great deal more than the production of gasoline and seventeen times as much as the increase in the production of crude oil supplies. This increase in demand has been partly offset by the fact that the use of gasoline as a solvent and for cleaning has increased only a little in ten years, so that most of the increase in production has gone to meet the motor car demand.

"It will also be noted that, proportionately, far more gasoline was obtained from the domestic crude produced in the year 1918 than in 1909. This increase has been made by a number of methods, among them the production of gasoline from imported crude oil and from natural gas, and by cracking fuel oils. But the principal one has been the taking of a larger proportion of the crude as gasoline.

"This gasoline has, consequently, a lower volatility and this fact is the cause of the complaints heard in recent years as to the quality of gasoline. The country has been faced with the problem of sacrificing quality or quantity; of using less volatile gasoline or having a shortage of supply.

Two Million More Cars to Supply

"It is claimed that the number of automobiles in the United States at the end of 1919 was 7,500,000; an increase of almost 1,500,000 throughout the year. It has been predicted that the number of automobiles in use at the end of 1920 will be between 9,000,000 and 10,000,000. The demand for gasoline, therefore, is certain to increase.

"On the other hand, it is possible that the future increase in the production of crude oil from our own wells will be relatively small as compared with recent years, and that though the importations of Mexican crude may be considerably increased, the gasoline content of this crude will continue low as at present, and it becomes a matter of some concern as to whether the production of gasoline can be increased in proportion to the increase of automobiles expected for this and succeeding years.

"It seems unlikely that the quantity of gasoline produced can be increased by using more of the crude and making the product less volatile, as has been done in the past. This is because the next fraction obtained from crude oil—kerosene—is in great demand and the price has doubled since the armistice. The point has been reached where an economic balance is approaching between gasoline and kerosene; thus, if any appreciable quantity of the lighter fractions of kerosene is included with the gasoline it will cause a shortage of kerosene with a consequent increase in the price.

"The other important means of obtaining more gasoline are, to extract it from natural gas and to 'crack' fuel oils. The extraction of gasoline from natural gas is approaching its maximum. It has been a comparatively new industry developed during the last ten years, but the gases that can yield gasoline have largely been exploited and it cannot be expected that there will be the same rate of increase in the production of this 'casing-head' gasoline as in the past.

"The process of cracking fuel oil into gasoline is not subject to the same limitation in the supply of base material, for fuel oil constitutes a large part of the crude oil refined. However, the changing of fuel oil into gasoline by cracking processes involves a considerable expense and waste of material. Therefore, unless the margin in price between the two is considerable, cracking is not profitable.

"Moreover, the demand for fuel oil has been increasing rapidly during the past year and the price has more than doubled. Our merchant marine, navy and many other large users of fuel oil have come into the market for large quantities and are planning to develop demands that will make the competition more keen. Therefore, it may prove to be unprofitable to crack more of our fuel oil into gasoline, unless the price of gasoline is also increased.

"It is probable then, that the quality of gasoline will not change much in the near future. If the engine and the carbureter of to-day can use the present quality of gasoline in a satisfactory manner, then they can continue to do so for some little time to come. Furthermore, it is probable that the idea of providing for the increase in the number of automobiles by using kerosene as fuel cannot be realized to any very great extent. Considerable amounts of kerosene, the total production of which in this country is only half as much as the production of gasoline, can be diverted to the automobile industry only if automobile users are prepared to pay a price greater than can be afforded in the regular uses of kerosene.

"The use of fuel oil in the internal combustion engine may be the solution of the problem. Fuel oil constitutes over 50 per cent of the products obtained from the crude oils refined in the United States. Some of this fuel oil is a comparatively light and volatile distillate, but much of it is a heavy, viscuous tar. It is used to-day for raising steam under boilers, for making or enriching gas, for cracking into gasoline, for metallurgical purposes, and for internal combustion engines of the Diesel type. This last use, considered in a large way, is by far the most efficient. And it is in this use of fuel oil that there is most possibility of solving the question of fuel supply for the automotive trade.

New Engine Real Solution

"If engineers are able to design an automobile or truck engine that will use fuel oil in a satisfactory manner, they will relieve the danger of the impending shortage and make possible the desirable extension of the use of the automobile and truck. An automatic engine using fuel oil can compete against any other large user of fuel oil because this will be the most efficient use to which the oil can be put. Consequently, the supply of motor fuel would be limited only by the total supply of fuel oil.

"One important exception must be made to this statement, and that is, that part of the oil now used as fuel can be made into lubricants. There has not been sufficient demand for lubricants in the past to consume all that that might be made from the crude oils of the country,

and the knowledge of how to obtain high-grade lubricants from certain kinds of oils, has been lacking. This knowledge is rapidly being acquired, and it is probable that our chemists will be able in the future to produce satisfactory lubricants from almost any crude.

Lubricant Demand to Increase

"The demand for these products is certain to increase in the future, for it must be emphasized that lubricants are the most necessary of all the products of crude oil. We might get along without gasoline, kerosene and fuel oil, but the industrial development of to-day would be impossible were it not for the enormous quantities of oil used to lubricate every moving part of our machinery, and these lubricants can be obtained in sufficient quantity only from our petroleum.

"The preceding statements have been made, taking into primary consideration the crude oil supplied by the oil wells of the United States and Mexico. There are, however, several sources of motor fuel which will probably come into use in the future. The most important of these are the enormous quantities of oil-bearing shale, found chiefly in the States of Colorado, Wyoming and Utah. Crude oil very similar to petroleum can be obtained from these shales by distillation processes.

"These shales constitute a reserve of oil many times greater than the supply in the oil fields, but this reserve can be made available only at considerable expense and only after the development on a large scale of mines, retorting plants and refineries. It will require investments of hundreds of millions of dollars and a period of many years to develop the shale industry, but it will eventually be of great value as a source of oil.

"A source of motor fuel which is more important to-day, though possibly of less ultimate value than the deposits of shale, is found in coal tar. When bituminous coal is distilled a considerable number of by-products are produced, among others, a quantity of benzol and toluol. These are usually sold in mixtures known as 'commercial benzol' and this 'benzol' is in use to-day in considerable quantities as a motor fuel.

Old Ovens Lose By-products

"At the present time an average of 75,000 tons per day of bituminous coal is still being distilled in the old-style 'bee-hive' coke ovens, and the tar and volatile products are lost. As by-product coke ovens come into more general use there will be an increasing production of benzol, which can be blended with gasoline and thus add to our motor fuel supply.

"Another substance which can be used for motor fuel is alcohol. Alcohol can be used without blending, in automotive engines, if the carbureters and cylinders are re-designed for efficiency. It cannot be blended directly with gasoline, but mixtures of alcohol, benzol and gasoline can be made which will not separate on standing. Such mixtures are being used in a limited way at the present time and it is probable that this use of alcohol will increase if the price of motor gasoline increases.

"Alcohol can be produced from a large number of vegetable waste products, such as molasses, small potatoes, etc., and it is probable that it can also be obtained from other vegetable wastes, such as sawdust, although this has not been demonstrated commercially.

Gasoline to Hold Quality

"To sum up, the motor fuel problem must be considered in two aspects; in the immediate future, it is likely that there will be little change in the character of the gasoline sold throughout the United States. Surveys made by the bureau show that the change in volatility of motor gasoline from April, 1919, to January, 1920, is so slight that it is negligible.

"The more distant future is, of course, problematical, but it is estimated that, all sources considered, there will be a sufficient supply of motor fuel, although it is probable that it will be more expensive in proportion to the general run of prices than it is to-day. Some of this fuel can be used as at present, but it will probably be necessary to design new engines to use fuel oil, as it is doubtful if the present gasoline engine and carbureter can be modified.

Berliet Postpones Light Car for Year

PARIS, March 1 (*Special correspondence*)—Berliet, who nearly a year ago announced that he would produce a cheap 15 hp. touring car on American lines, now states that this machine will be held back for one year. This has been done in order to enable the factory to work exclusively on trucks, which are being produced at the rate of 30 per day.

The original plan was that the 15 hp. touring car should go into production at the rate of 10 to 12 per day with a rapid increase to 100 per day. This car is decidedly on American lines, it has a comparatively big 4-cylinder engine, 3½ x 5.1 in. It is provided with an American-made lighting and starting set.

A new factory has been erected since the war with an area of 62 acres for the construction of this car. This surface covers the shops only. The total area covering workmen's dwellings, co-operative stores, and other buildings being 100 acres.

Practically the whole of the engineering industry of Lyons is held up by a strike. Only two or three per cent of the men are at work at the Berliet factory, and production is practically nil.

MARVEL INCORPORATES

WELLAND, ONT., March 12—The incorporation is announced of the Marvel Co., Ltd., of Welland. The new concern will manufacture automobiles and equipment, including the steering device for Ford cars known as the "Marvel."

Gasoline Situation Alarms England

Profiteering Committee Lays High Rates to Powerful Financial Interests in Control

LONDON, March 2 (*Special correspondence*)—The following digest from to-day's Times conveys a good idea of the scope and points of the just-issued report of a special committee on behalf of the central profiteering committee which has been inquiring into the costs and profits of gasoline, benzol and other motor liquid fuels. The exchange conversions are at pre-war rates.

Powerful financial interests are taking advantage of the deficiency of motor fuel to raise prices.

The concentration of control of prices in two enormously powerful "combines," practically world-wide in their scope, constitutes a power so dangerous, should it happen to be improperly used, that prompt international action is imperative.

The two main groups concerned are the Standard Oil and the Royal Dutch Shell.

An exorbitant profit is being procured by the producer or refiner of petrol at present market prices.

Petrol sold at $115 a ton, f.o.b. New York, shows a grossly excessive profit.

When the Anglo-Persian Oil Company's existing contracts expire in 1922, the British Government, which holds a controlling interest in the company, should insure the sale of the products at a reasonable figure.

A fair average rate of transport could not exceed $25 per ton (8 cents per gallon). Estimates of present rates vary from $55 to $82 per ton.

Distributing companies' profit allowance should be reduced from 4 to 3 cents per gallon, and retailers' profit from 10 to 8 cents.

Retail prices should be fixed by the government for periods of three months.

The output of benzol has fallen considerably since the armistice. The National Benzol Association has regulated the price to conform with that now charged for petrol.

Suggest League of Nations' Action

The members of the League of Nations should take joint action for their mutual protection against exploitation.

The only ultimate solution of the problem is the production of home and/or empire produced power alcohol under government encouragement and effective control.

The Board of Trade should fix wholesale and retail maximum prices for petrol in this country.

At present No. 1 petrol should be retailed at 2s. 10½d. (69 cents) per gallon, and No. 3 at 2s. 8½d. (65 cents).

The price of benzol should be fixed at 2s. 8d. (64 cents) per gallon, the garage allowance being reduced from 5d. to 4d. (10 to 8 cents) and its export should be prohibited.

Denby Acquires Control of Fulton

Long Island Truck Company Sold at Receiver's Sale for $290,000

NEW YORK, March 12—At the auction sale to-day conducted by the receiver, stockholders of the Fulton Motor Truck Co. of Farmingdale, L. I., combined with Garvin Denby and other financial interests, purchased the factory and property for $290,000.

A new company, to be known as Fulton Motors Corp., and to be headed by Denby, who was president and general manager of the Denby Motor Truck Co. of Detroit before its reorganization a year ago, is being formed with Denby as president and general manager. It is announced that the capital of the new company will be $1,500,000 of Class A stock at $10 par value and $350,000 of Class B stock of no par value. Through ownership of a majority of the Class B stock Denby will have control.

It is the intention of Denby to continue the manufacture of the Fulton truck as at present designed and to shortly add some larger heavy duty models. All of the company's dealers are to remain in the organization, and old contracts will be renewed, while, in addition, large export orders are said to have been offered.

The production, which practically stopped when the plant went into the receiver's hands, is to be started again immediately. The receiver had retained a majority of the working force so as not to disrupt the organization, and there are large quantities of material on hand.

An election of officers of the new Fulton company, a Delaware corporation, is scheduled to be held in a few days. While it is not possible at this time to give more than the name of Garvin Denby as president, it is stated that all of the directors will be motor truck men with an individual interest in the company, and who will be heads of the various departments.

The bidding at the sale to-day was spirited. It started at $25,000 and rose rapidly to $200,000. After that it became a dual between the representative of an exporter, who is said to have been looking for an Eastern source of supply, and H. M. Hackett, president of the Denby Motor Truck Co. of Canada, representing Denby's interests and the stockholders.

TO PROBE TRUCK PURCHASES

WASHINGTON, March 12—A resolution has been introduced in the House of Representatives inquiring whether the War Department has contracted for or purchased militor motor trucks or tractors, parts for them, and if so, the quantity. The resolution also asks how many of these trucks or tractors are available, the authority or law under which they were purchased, how many other trucks or tractors held by the War Department are available and the numbers of trucks and tractors which were sold by the War Department or its agencies abroad, in Europe or this country. Inquiry is also made as to whether or not purchases of militor trucks was disapproved by any branch of the War Department.

The resolution was introduced because during the debate on a resolution authorizing the transfer of motor vehicles by the War Department to the Bureau of Public Roads and other Government bureaus, it was discovered, it is claimed, that seventy militor trucks, valued at $8,000, were purchased within the last few months by the War Department.

Belgium to Show Cars During Olympic Games

PARIS, Feb. 18 (*Special correspondence*)—The first Belgian postwar automobile show will be held at Antwerp from May 15 to June 13, on the occasion of the Olympic games. The exhibition will be open to all types of passenger cars, equipment, wheels, forgings and castings.

From June 24 to July 25 the exhibition will comprise trucks, tractors, stationary engines, motor boats, and aviation engines. These two exhibitions are officially recognized by the manufacturers' associations of Belgium and France. Entries can be received up to March 1, and the drawing of lots for positions will take place on March 15. The price of stands is 300 francs per square meter, the stands having a uniform area of 40½ meters. This price is inclusive.

Cable entries from America addressed to the "Comité des Fêtes, 21, rue Arenberg, Anvers," will be accepted.

AUSTRALIAN REGISTRY, 55,459

NEW YORK, March 12—The Motor Traders Association of the Commonwealth of Australia gives the total number of motor vehicles in the Commonwealth at 55,459, divided between the States as follows:

	Cars and lorries
New South Wales	23,373
Victoria	16,207
South Australia	8,512
Queensland	2,506
West Australia	2,023

WILL RETAIN AVIATORS

WASHINGTON, March 12—Despite reports that have been circulated, Major General C. T. Menoher, director of the Air Service, has never at any time said that the 1349 officers of the Air Service would be either demoted or dropped from the service, according to a statement made by him to-day.

"However," the director says, "in order to reduce the number of Air Service officers stationed in Washington it has been found necessary to transfer some officers to flying fields and other Air Service stations in the different parts of the United States."

French-Moroccan Air Service Started

Passengers and Mails Carried on Regular Schedule in Thirty-Hour Trip

WASHINGTON, March 12—A commercial Aerial Transportation Company has been incorporated under the name of "Lignes Aeriennes Latecoere," and has established a commercial air line running from Toulouse, France, to Rabat, Morocco, according to information received by the Air Service. The machines leave France at 9 a. m. and arrive at Morocco in the afternoon of the following day.

Ordinary and registered mail for western Morocco may be sent in this way. French official mail between France and Morocco goes by this route. The average passenger and freight carrying capacity of airplanes traveling this route is approximately 1100 lb. This does not include the pilot and fuel for about 5½ hr. flight.

Charges in addition to the regular postal rates may be covered by the ordinary postal stamp, and mail marked "by airplane from Toulouse to Rabat" is accepted at all post offices. The company operating this line is subsidized by the French Government by an allotment of 10,000,000 francs to cover a period of fifteen years for the purchase of new equipment, and an additional subsidy of 4,000,000 francs has been granted by the Moroccan Government for the same purpose. The representatives of the company state that the financial condition of the company is satisfactory.

The airplanes which first started the service were Breguet biplanes with 300 hp. Renault motors. The company is substituting a new type plane which will carry two passengers, equipped with the Salmson 250 hp. motor. This company is maintaining regular service in all weather conditions since organized. The pilots are all reserve officers of the French aviation, their average pay being 20,000 francs a year. The mechanicians are all demobilized from the Army Air Service.

No stop is necessary at the international frontiers, the customs inspection being made at the first authorized stop in the country. A great deal of interest is attached to this line due to the fact that it operates over greatly varying and exceedingly difficult country with uniform success. Not only are weather conditions very changeable in Spain, but the country offers practically no ground suitable for forced landings. In addition, violent and changeable winds are experienced over the Straits and the northern part of Africa.

HAVANA SERVICE STARTS

WASHINGTON, March 12—The first airplane service between Palm Beach and Havana was inaugurated March 2 with the arrival at Havana of a seaplane carrying passengers. The flight was made in 2 hr. 55 min.

Engines and Boats Shown at Olympia

Many American Models to Be Displayed in Competition With European Designs

LONDON, March 12 (*Special correspondence*) — The Society of Motor Manufacturers and Traders, Ltd., will hold a show of marine motors and boats at Olympia from March 12 to 20 in collaboration with the Ship and Boat Builders Association, Ltd., and the British Electrical and Allied Manufacturers Association. There will be exhibits from the United States, France, Sweden and Denmark, and possibly Italy, besides Great Britain.

There will be engines from 2 hp. with single cylinder to 500 hp. with 18 cylinders. The boat exhibits will range from pleasure skiffs to fishing boats and lifeboats of the sort which the Board of Trade insists on all passenger ships carrying a supply of.

A comparatively new sort of exhibit will be a "knock down" boat, which consists of frames previously erected and fitted, after which each part is taken down and packed in a very small compass and crated for shipment to any part of the world, all that is left for the purchaser to do being to reassemble the parts and planking, which latter is also supplied ready sawn and cut to shape. By this system boats can be supplied to builders and amateurs at considerably less cost than would be possible if each boat were designed separately.

One firm has no less than 40 designs, ranging from an 18-ft. launch to a 65-ft. cabin cruiser or freightboat. Boats of this sort are doing service in India, Australia and other parts of the globe, where the services of naval architects, designers and skilled boat-builders are not available. Also a new system of skiff-building will be shown on the "knock down" principle.

The electric exhibits will include a variety of house and possibly farm lighting plants, of which importers of American sets have the means for a big and interesting display.

FORD DENIES TOLEDO RUMOR

DETROIT, March 12—Another Ford story, to the effect that the Detroit manufacturer was planning to build a huge tractor plant in Toledo, was denied at the offices of the Ford Motor Co. The report was that Ford had purchased 800 acres in Perrysburg, a Toledo suburb. Frequency of stories of new plans of Ford have compelled the installation of what might be termed the "no" department. Hardly a day passes, according to Ford officials, on which they are not called upon to deny stories of new ventures.

GARFORD TO AID OWNERS

LIMA, OHIO, March 12—The Garford Motor Truck Co. has established a new department, the duties of which will be to gather information on the operation of motor trucks and to aid owners in obtaining the lowest cost per ton-mile.

It will be known as the transportation engineering department, and will be in charge of the transportation engineer, whose experience with motor trucks and with haulage problems is extensive. The department will investigate the operation of Garford trucks in all parts of the country, obtaining data relative to the operating costs and actual service.

Car Makers Present Views on Shipping

Requirements from Railroads Discussed at Meeting with Car Service Division

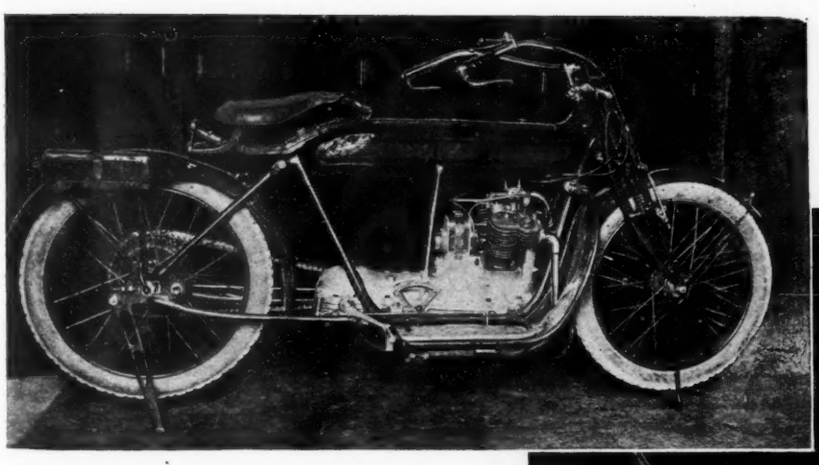
WASHINGTON, March 12—Representatives of the traffic departments of a number of the large automobile companies, headed by J. S. Marvin, general traffic manager of the National Automobile Chamber of Commerce, conferred with representatives of the Car Section Commission in Washington, Wednesday, over the car shipping situation.

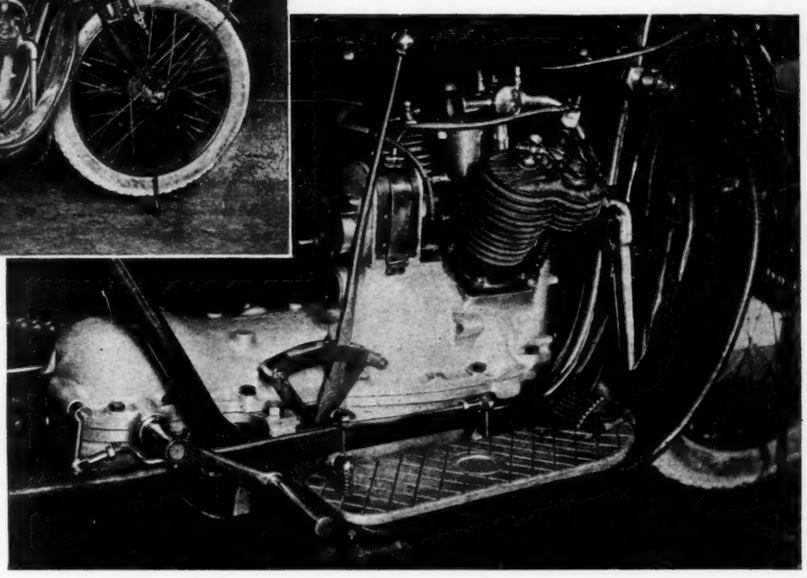
During the past two years freight cars have not been restricted as to routing according to ownership. The heaviest production comes from the Michigan-Toledo zone, and A. H. Smith, at that time eastern regional director, placed an official at Detroit to supervise the distribution of automobile cars.

The change from Government to private control naturally changes this policy, and it was with a view to obtaining rules and regulations covering the subject that the meeting was held. No formal action was required, the meeting being a general discussion of the points involved in these changes.

Those attending the meeting were: A. H. Brown, Nordyke-Marmon; C. R. Scharff, Chevrolet; George C. Conn and A. H. Merrick, Buick; E. A. Hodge, Hupp; W. R. Short, Studebaker; George Main, Cadillac; F. H. Thompson, Willys-Overland; W. G. Dibble, Hudson; J. H. Myler, Maxwell; J. S. Marvin and Pyke Johnson, National Automobile Chamber of Commerce, and Commissioners Kendall, McGarry, Barnes and Nelson.

New Brevets Spring Motorcycle Has Automobile Type Power Plant





The Brevets Spring motorcycle made its bow at the Belgian show recently. It was built at Liege, and it is declared that one of the British motorcycle firms has secured the rights to build it. The power plant comprises a twin cylinder air-cooled V engine of 65 x 75 mm. bore and stroke, disk clutch, three sliding gears and bevel drive to cross shaft. Power is transmitted to the rear wheel by chain

Industry Gets 24,000 Cars in February

Shipments in Month Exceed February, 1919, by 5,000—Overland Deliveries 22,000

NEW YORK, March 12 — Reports of automobile shipments reaching the National Automobile Chamber of Commerce recently indicates that more than 24,000 carloads of machines were shipped in February, as compared with 19,152 carloads in February, 1919. Notwithstanding the adverse shipping conditions, these figures exceed any previous record for the month of February. In addition to these more than 22,000 machines were driven overland.

At Washington on March 1, when the car service section started business as a branch of the American Railroad Association, the Chamber again presented the question of how automobile cars are to be handled when Federal control ceased. All special arrangements on such as coal cars and automobile cars were supplanted by car service rules, the underlying principle of which is that each road is entitled to have its own cars returned to it. The commission is authorized to suspend or permit departure from the car service rules or to exempt when necessary cars of any type.

The automobile situation is very actively before them and they agree to name an early date for a conference with the N. A. C. C. to determine what can be done to assist the industry. In the meantime to take immediate advantage of competitive influences, the Chamber has telegraphed the traffic heads of Western and Southern lines the imperative need of sending automobile cars into the manufacturing territories, asking that they advise the Chamber of their action.

The responses indicate that the lines are being checked with a view of loading automobile cars and getting them into service. The traffic department of the N. A. C. C. is co-operating in every way.

TO DESIGN CHASSIS

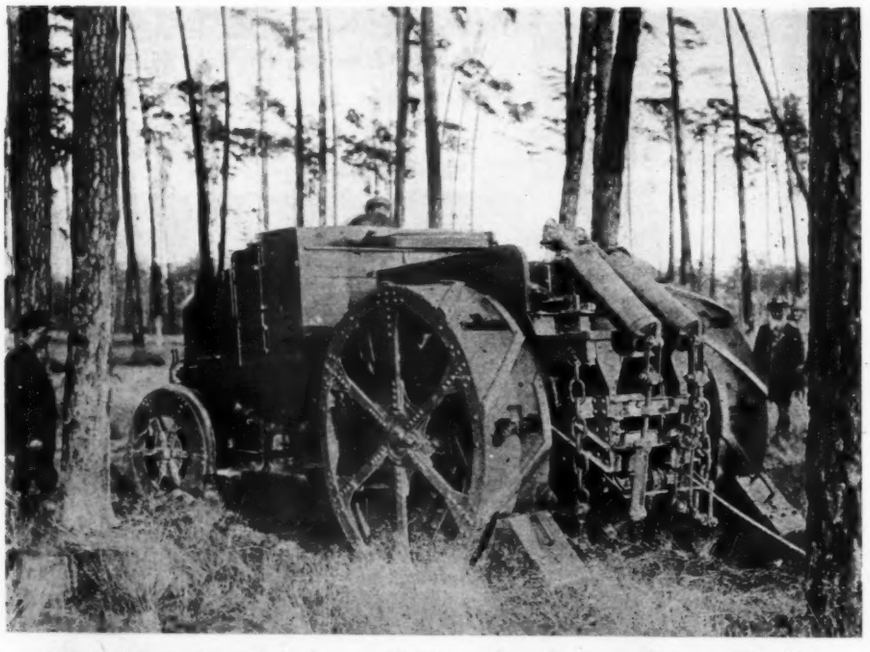
NEW YORK, March 12—The Chassis Lubricating Co., Inc., of New York, which was organized recently, is co-operating with engineers in working up designs for particular chassis, incorporating the Myers magazine oiling system, which was shown on several makes of trucks at the New York show. The invention is the product of Cornelius T. Myers, and provides a magazine oiling system for spring bolts and springs, consisting of hollow shackles and brackets. It provides a two months' oil supply, which is fed by capillary attraction, only when the truck is in motion. The system prevents moisture and dust from getting into the pin bushings.

SELDEN PRICES GO UP

ROCHESTER, March 12 — Increased prices on all models were announced by the Selden Truck Corp. of Rochester, effective to-day. The changes are as follows:

1½-ton "Selden Special"....	$2,240	$2,460
2½-ton Model 2½ A.....	3,290	3,550
3½-ton Model 3½ A.....	3,990	4,325
5-ton Model 5 A.....		5,770

This German War Tractor Found a Civilian Job



The business of beating the sword into a plow-share continues. This illustration shows the most powerful tractor that in wartime pulled the heaviest German bombardment guns converted into a tree-pulling machine. It uproots the heaviest trees and is a great time-saver

Gasoline Unchanged in Year, Tests Show

Government Reports Little Variation in Quality Shown in Countrywide Samples

WASHINGTON, March 12 — Gasoline and motor fuel, as marketed throughout this country, has changed but slightly during the twelve months just ended, according to a report made public by the Bureau of Mines, as a result of investigations between Jan. 17 and Feb. 3. Eighty-one samples of fuel were collected by representatives of the Bureau, in Washington, New York, Pittsburgh, Chicago, New Orleans, Salt Lake City and San Francisco, the samples being taken in such a way that they represented the commercial output then being marketed in those districts.

"The Bureau of Mines, on studying these surveys, concludes that on the whole there has been little change in the nature of the motor fuel marketed throughout the country in the period from April, 1919, to January, 1920," the report states. "Refiners should take more care in some cases to avoid an excess either in the use of casinghead gasoline or of heavy naphtha."

A similar survey had been made in April of last year. Future work of the Bureau contemplates that such investigations will be made hereafter in January and July of each year. Details of the report follow:

"It will be noted that, while there have been some changes in the gasoline supplied to the individual cities, nevertheless, the general average of the January, 1920, survey is almost identical with the general average of the April, 1919, survey. The only noticeable difference will be found in the end point, which has risen 10 deg. since 1919. In other words, there has not been as much change in the last nine months as might have been expected, when the great changes that occurred in past years are taken into consideration. At the ninety per cent and dry points the average gasoline is very close to the specification.

Too Much Casinghead Gasoline

"When taking up the individual samples, however, several points must be noted. In a number of instances it was found impossible to recover 95 per cent of the sample in the receiver when using a mixture of ice and water in the condenser bath. This indicates that the sample contains an excess of low boiling fractions, which is probably due to an admixture of 'casinghead' gasoline.

"On the other hand, there are a number of samples which are above the specification at the upper part of the distillation range. When this occurs it indicates either that the refiner did not use modern tower stills, or that an excess of high-boiling naphtha has been used in blending. These samples when used in the average motor car would be apt to cause excessive carbonization, and also dilution of the crankcase oil."

Ontario Adds 1402 Miles to Road Work

Good Roads Enthusiasts Hear Inspiring Reports at Annual Convention

TORONTO, March 12—Much to the satisfaction of the trade and industry that has done so much to this end the good roads movement is moving on to a flood that will carry all before it in Ontario. That fact was demonstrated last week in Toronto at the road conference for county road superintendents and engineers held in the Provincial Parliament Buildings, and at the annual meeting of the Ontario Good Roads Association held in the York Municipal Buildings. It was estimated that between five and seven hundred road builders and enthusiasts from the province attended the two conventions, which were highly successful.

Another important factor to be noted of road conferences is the fact that during the week announcements made by the Minister of Highways were more definite than at any time since he assumed office last fall. He announced that the route of the trans-provincial highway from London to Windsor would be via both the Talbot and the Longwood Roads, a decision which has been under consideration for over a year.

The big feature of the week's announcement was the designation of additional roads to the trans-provincial highway system, whereby 1402 miles are added to the existing 422 miles, making a total of 1824 miles of provincial-owned highways (in addition to county, township, municipal and market roads).

It may be roughly estimated that the cost of constructing this mileage in the next five years will be about $23,000,000.

Since 1914 road construction in Ontario has not been very active on account of the war. While last season was the first year of peace the spirit of carrying out the good roads movement was not generally apparent owing to unsettled situations, yet over $6,000,000 were spent on roads in this province. But this year promises to see by far one of the greatest road construction programs ever started in the 37 counties of Ontario and along the trans-provincial highway system. The trend of the times has awakened the road builders of this province to the necessity of building roads in all sections of the province, and the movement is being pushed forward with great enthusiasm and confidence.

Would Increase License Fees

A resolution favoring increasing motor license fees as a method of raising money for highway improvement purposes was passed. The convention recommended that the Highway Act be amended to permit road commissions to spend road money for tree planting along the highways.

L. E. Allen of Belleville succeeds K. W. McKay of St. Thomas as president. McKay and C. R. Wheelock, of Orangeville, another past president, were made honorary presidents of the association. Other officers elected were: Vice-presidents, T. J. Mahoney, Hamilton, and W. H. Brown, Cheely; secretary-treasurer, Hon. Geo. S. Henry, Todmorden; directors, F. A. Senecal, Plantagenet; J. A. Sanderson, Oxford Station; William Nugent, Belleville; W. H. Pugsley, Richmond Hill; Major T. L. Kennedy, M.P.P., Dixie; J. E. Jamieson, Singhampton; John Currie, Strathroy; J. E. Watters, Niagara-on-the-Lake, and S. L. Squire, Toronto.

Police Aviators Guard Against Airplane Smugglers

Smuggling in airplanes has become a very profitable trade in Holland, Germany and Spain. This photograph shows German police aviators examining packages carried by a flier. All airplanes arriving in Germany are carefully watched

SCHOFIELD TO MAKE TRACTOR

TORONTO, March 12 — The Schofield Tractor Corp., Limited, has been incorporated under the Ontario Companies' Act, with an authorized capital of $1,000,000. The head office will be at Toronto, Ont. The company has acquired from the Orillia Tractors, Limited, the Canadian rights for the Schofield Automotive Tractor. They have secured factory accommodation on Dufferin Street, and are now getting the necessary machinery. They expect to be in production with a few months.

MAKES OLD TIRE PRODUCTS

INDIANAPOLIS, March 12—The Rub-Tex Products, Inc., has been organized with $750,000 capital to manufacture automobile floor board mats, running board material, pads, spring and body bumpers, windshield, fan belts and other automotive equipment in the rubber line, and has leased a local manufacturing plant. The Rub-Tex process which was developed by Louis E. Klug, general manager of the new firm, utilizes old tires.

German Magnetos Bid for Markets

British Makers Fear Sweeping Away of Business with Trade Resumed

LONDON, Feb. 27 (*Special correspondence*)—Sir Auckland Geddes, who, it is said, is to be British Ambassador to the United States, at a luncheon tendered him by the Association of Weekly Trade and Technical Journals, advocated the resumption of trade with Germany to restore credits and bring exchange to par value. He expressed little fear of the effect of competition upon British industry.

(So far as the motor industry is concerned, the magneto, which is the chief competitive item facing the British manufacturer, cannot be imported except under license, and, as already there are calls for the German magneto for British engines, the future looks blank for the half a dozen British makers' magnetos which the war's needs called into being.)

S. F. Edge stated recently that German magnetos are being offered upon the British market at $10 each, the British machine being priced at $75, so that it is not to be wondered at that this invitation to trade with Germany is not relished by the British magneto makers

CHEVROLET PRICES RISE

NEW YORK, March 12—Chevrolet Motor Co. has advanced prices for all its passenger models $60 a car, the new schedule being effective March 1.

Production Topic of C. C. U. S. Convention

Will Seek Means to Greater Output as Solution to Return to Normal Conditions

WASHINGTON, D. C., March 16—The eighth annual convention of the Chamber of Commerce of the United States, to be held in Atlantic City, April 27 to 29, will be made an "Increased Production Convention," in an effort to work out plans for the re-establishment of normal business and price conditions.

The general subject of increased production has been divided up in the program for the convention into sub-subjects. The first of these is the Government in relation to production. Under this heading will be considered anti-trust legislation and taxation.

Second of the general subjects will be transportation in relation to production. This will include both land and water transportation. One of the chief causes of lack of production, it will be pointed out here, is the general shortage of railroad equipment. International finance and its relation to world production has a prominent place on the program.

One general session of the convention will be given over to agriculture in relation to production. Another important general subject will be the relation of labor to production. This will be approached from both the side of the employee and employer. Group meetings in addition to the general sessions will discuss means to increase production.

Seek Information on British Import Tax

LONDON, March 5 (*Special Correspondence*)—The American Chamber of Commerce in London is sending a deputation from its motor group to ask the president of the Board of Trade what the future policy of the British Government will be as regards the 33⅓ per cent c.i.f. import duty at present imposed on imported passenger cars, the bulk of which come from the United States.

The duty is a temporary one, and, as emphasised by the Chancellor of the Exchequer last spring, can be imposed only if approved by the Parliamentary vote upon the budget each year. There are persistent rumors that the Government contemplates removing the tax with the introduction of this year's budget; on the other hand there are equally persistent rumors that the Government contemplates no such thing.

The American Chamber of Commerce in London, which represents in its automobile group practically the entire trade importing from the United States, has asked Sir Auckland Geddes to receive this deputation and throw such light as he can on the future position, in order that these Anglo-American traders may know where they stand and what to count upon.

If there is no possibility of the removal of the tax, it is to be urged that it be assessed on an ad valorem basis instead of c.i.f. If, on the other hand, the tax is to be removed, the Government will be asked if it contemplates any arrangement for cars in the docks at the time of the removal.

The present 33⅓ per cent duty c.i.f. on passenger cars when added to the depreciated purchasing power of the pound sterling and the high freight rates, makes it impossible to sell an American car in Great Britain at much below double its American price. Commercial vehicles have been free of import duty.

EDGE FORMS NEW COMPANY

LONDON, March 2 (*Special Correspondence*)—The formation of the firm of Edge & Napier, Ltd., is announced today, the members of the firm being S. F. Edge, of the Napier car fame, and J. S. Napier. The latter member of the firm is in no way associated with the Napier Motor Co. but recently has been serving as an engineer and writer on motor technics. He was for some years associated with Arrol Johnston and later with the Humber Works, Coventry. The full plans of this firm have not been disclosed.

This news definitely corrects an item published in AUTOMOTIVE INDUSTRIES, issue of Jan. 15, in which it was stated that a rumor had it that S. F. Edge had joined the directorates of the Armstrong-Siddeley and the Auto Carriers, Ltd. Edge formed no such connection as then reported.

TO MAKE CARRICO GEARS

DETROIT, March 16.—The Carrico steering gear will be manufactured by the Steering Gear and Parts Co., which has exclusive rights to the manufacture of these gears. This concern owns a large plant at Detroit. Officers of the company are:

H. S. Hall, president, vice-president of the Lewis-Hall Iron Works and president of the Lewis-Hall Motors Corp., builders of Hall trucks. Henry B. Lewis, vice-president, president of the Lewis-Hall Iron Works and vice-president of the Lewis-Hall Motor Corp. Archibald Carey, secretary. The above, with F. D. Carrico, constitute the board of directors.

GETS AEROMARINE RIGHTS

NEW YORK, March 16—Sales rights for the planes of the Aeromarine Plane & Motor Co. of Keyport, N. J., for that territory in the United States west of the Allegheny Mountains have been taken over by Continental Aircraft, Inc., of Chicago. This announcement was made at a dinner in New York held in connection with the show of the Manufacturers' Aircraft Association. The Continental company is headed by Harry Newman, of Chicago, who is well known as a distributer of automobiles and airplanes in that city. Statements made at the dinner were to the effect that the sales company had contracted for a number of seaplanes to be sold for use on inland waters and on the Pacific.

Ford Gets Rights to Spanish Plant

Early Production Planned at New Assembly Station at Cadiz Free Port

WASHINGTON, March 15—The Ford Motor company has been granted authority by the Spanish Government to establish an automobile assembling plant within the zone embraced in the "Free Depot" of the port of Cadiz, Spain, according to a report received from the American Consulate office at Cadiz, by the Bureau of Foreign and Domestic Commerce.

The company has already shipped considerable machinery and is commencing installation and expects to start assembly in the near future.

Cadiz is commonly spoken of as a "Free Port," but in its entirety, it is not that. It does, however, possess a "Free Depot" zone, embracing certain of its harbor facilities; a concession from the national government that no other Spanish port now possesses. In effect, imported goods can be landed in this specified zone without immediate payment of customs duties; and for such goods as are re-shipped to other countries, no duty whatever will have to be paid. If these goods are distributed in Spain, they must pay the regular duties.

The Ford company proposes to utilize this right. Such of its cars as are put up here and then shipped to other countries, like Portugal, or to those in Africa, will be freed of Spanish customs duties. Only those that are marketed in Spain or in its colonies, will be liable for duty.

The ownership and operation of a plant of this kind, so advantageously situated as regards customs duties, will permit of great savings in the way of ocean freight. The present rule is to bring in cars here that have already been set up, and then crated, which necessarily demand a great amount of space on board vessels, which has to be paid for, and at the prevailing high rates of freight, at so much per cubic foot.

The company will be able to avoid doing this, and instead bring the cars in parts, in compact bundles, that will utilize the full carrying capacity of a vessel. The saving of the crating expense alone is no inconsiderable item. All of these savings will result in a very great lessening of the present selling price of the Ford car, and it will be placed within the reach of many more purchasers. It is expected that the export of these cars from here, especially to countries in Africa, will become a considerable total.

SPAIN CHANGES DUTIES

WASHINGTON, March 12—By a decision published in the customs bulletin of Spain, under date of Nov. 21, 1919, the top, lamps and horn of an automobile are to be dutiable separately under the corresponding tariff numbers, and not as a part of the automobile, according to a recent commerce report.

Olympia Truck Show Set for October

Will Precede Passenger Car—Propose Also Separate Body Exhibit

LONDON, March 12—The Society of Motor Manufacturers and Traders, Ltd., have decided to hold a truck show in Olympia during October. The actual dates will probably be prior to the 20th, to give time for clearance and preparation for the car show which will, in all likelihood, be held early in November.

Regarding the proposition of finding space for the exhibit of cars on the scale expected to be required, nothing so far has been decided by the society. The proposal, one of three alternative suggestions, to run a second exhibition at Olympia limited to body work and equipment has been balloted on with adverse results.

Certain sections of the trade are strongly opposed to a plan which suggests preferential treatment to the possible detriment of the coach-building trade, whose wares, it may easily be argued, are so valuable a factor of attraction to the car show.

ENGLISHMAN.

Oregon Wants Trucks for New Highways

PORTLAND, ORE., March 15—Oregon will be strongly in the market for motor trucks this year. This is already evidenced by orders placed with distributers, but behind that is the fact that the program of the State Highway Commission for road construction is greater even than last year, which was a banner road building season.

Already under contract for construction this year are a total of 816 miles of road, or 250 miles more than were built last year. This mileage is divided as follows: Paving, 212.7 miles; macadam, 207.9 miles, and grading, 392.3 miles. And this total will be considerably increased by contracts to be awarded by the Highway Commission this spring and summer.

Production Slow in French Plants

PARIS, March 1 (*Special Correspondence*)—Citroen to-day announced a further increase on the price of his car, bringing the selling price to 16,500 francs, or nominally $3,300. This car was put on the market a year ago at 7,900 francs, or $1,580. Citroen claims that most of his difficulties have been overcome and that he is now producing 60 cars per day. His original program called for an output of 100 cars per day by March, 1919.

Renault has decided to abandon his 10 hp. car which was first shown to the public at the last Paris Salon. It is understood that the first series of 1000 will go through the shops, but no more will be built. This car was announced soon after the armistice to be sold complete at $1,700. With Renault's reputation back of it the car attracted much attention and many orders were received. The car is pure Renault design at the front end, but is closely based on the Ford at the rear end.

It is declared that the test models have not given complete satisfaction. Renault's cheapest model will be a 12 hp. car with 4-cylinder engine, 3.1 x 5.5 in. This is listed at $4,600 complete with four passenger body. The car is practically the same as the pre-war type, with the addition of electric lighting and starting.

A loss of $85,639 on the year's working is recorded by the Mors Automobile Co. of Paris. By drawing on reserves and war profits it was possible to convert this loss into a net profit for the year ending September, 1919, of $759. Since the armistice the Mors factory has been principally engaged on work for the Citroen company. The losses are attributed to strikes, the 8-hour day, poor transportation, and the shortage of raw material.

AVRO TRIALS SATISFACTORY

LONDON, Feb. 28—(*Special correspondence*)—Trials of a new model Avro triplane, fitted with a Beardmore engine of 160 hp., have been completed satisfactorily at Hamble. The machine is said to have a low gasoline consumption, making at cruising speed of 80 m.p.h. about nine miles to the gallon of gas. A roomy and comfortable cabin has been fitted inside the fuselage, containing four seats, two facing each way. By removing the seats 113 cu. ft. of baggage space is obtained.

HENDRICK'S OFFERS REGISTER

NEW YORK, March 16—The new edition of Hendrick's Commercial Register, published by the S. E. Hendricks Co., Inc., has come off the press and is being offered as a buyers' reference. It is an annual register of manufacturers, dealers and consumers in the engineering, metal, contracting, mining, chemical, electrical, mechanical and similar industries. It contains some 2500 pages of names and addresses, giving several indices for the quick location of industrial names.

HAYES OPENS NEW PLANT

LINDSAY, ONT., March 12—The plant of the Dominion Wheel Co., which has been closed down for three years, has been re-equipped with machinery for the manufacture of truck wheels, passenger car wheels and special repair work on passenger car and truck wheels. It will be operated by the Hayes Wheel Co. of Canada.

PURITAN BUYS A. B. C.

DETROIT, March 7—The Puritan Machine Co. has purchased the A. B. C. Starter Co., manufacturer of electric starting and lighting equipment for Ford cars.

Detroit Not Scary of Steel Shortage

Fear That Railroads Will Commandeer Market Ridiculed by Car Makers

DETROIT, March 14—Reports that the automobile industry would be sacrificed by the steel manufacturers for the benefit of the railways are not taken seriously here. A rumor became current that the steel mills after July 1 would devote the entire output to the railways, leaving the automobile industry without any source of supply.

Representatives of steel companies in Detroit characterize the report as ridiculous, and automobile executives declared they felt no concern on that score. They contend that the railways will demand only steel rails and heavy plate, while the automobile industry uses lighter plate and bars.

Where the effect will be felt more seriously is in the structural and building trades, which, of course, will have some effect on the automotive industry, however, there is no fear that conditions will be as bad as in the early winter, when manufacturers scraped their plants to dig up every ounce of steel, and many of them were paying enormous prices, and in many cases premiums and bonuses for steel.

Conditions to-day are much better than they have been for some time, and will continue to improve, according to men conversant with conditions in the steel market, and who are at all times alive to every move likely to have an effect on the industry.

W. W. Raymond, of the Detroit Pressed Steel Co., F. J. Haynes, acting general manager of Dodge Brothers, and J. H. Main, purchasing agent of the Cadillac Motor Car Co., declared the steel crisis was passed some time ago, and looked for conditions to improve steadily.

Prices High in Market

At least two leading Detroit automobile manufacturers, unable to get sheets of automobile quality in open market have paid $90 and $92 in Pittsburgh for from 3000 to 5000 tons of prompt open-hearth sheet bars, which are being turned over to certain mills for conversion.

Most of the automobile factories caught when the shortage came in the winter, are accumulating a reserve wherever possible, despite the present high price, in order to safeguard themselves in the event of any emergency.

While the transportation systems of the country necessarily are considered as having first call upon the steel mills, automobile manufacturers contend that steel men will not permit them to suffer as a result of short sightedness on the part of Federal officials, who have permitted the railroads to deteriorate during the two years of Government control. They contend they will be taken care of, and while maximum output may not be reached there is little likelihood of any serious curtailment.

Gasoline Situation Shows Improvement

Supply in Reserve Greater Than Last Year and Close to Normal

WASHINGTON, March 12—In view of the reports of a shortage of gasoline and crude oil and the predictions of officials in the oil industry that gasoline would increase to as high as 35 cents a gallon, figures just made public by the Bureau of Mines, Department of the Interior, are particularly important. These show that the situation as regards gasoline is considerably better than it was a year ago. A total of 446,793,431 gal. of gasoline were on hand at the refineries, as of Dec. 31, 1919, compared with 297,326,983 gal. in 1918, and 412,256,833 gal. in 1917, displaying a recovery from the war time conditions.

Crude oil shows an alarming decrease in the stocks on hand and especially so in view of the fact that production has increased steadily during the last few years. The crude oil on hand as of Dec. 31, 1919, was 13,143,285 bbl., against 15,749,771 bbl. on Dec. 31, 1918, and 11,638,433 bbl. on Dec. 31, 1917. This shortage is particularly noticeable as production of crude oil has increased steadily with 1,046,052 bbl. per day in December, 1919, as compared with 869,618 bbl. per day in December, 1918, and 811,484 bbl. in December, 1917.

That there is a distinct decrease in the surplus of gasoline, despite the large amount on hand at present, is also shown by the fact that, with production at 10,827,729 gal. per day in December, 1919, the stock on hand at the end of the month totaled but 446,793,431 gal., while in 1917 a daily production of 8,027,311 gal. was combined with the stock on hand on Dec. 31, 1917, for a total of 412,256,833 gallons.

Lubricating oils show a slight decrease in stock on hand compared with a distinct increase in the daily production. Kerosene likewise shows a decrease in stock for Dec. 31 of each of the past three years against the constantly increasing daily production.

Tractor Study Class Opened in Buffalo

BUFFALO, March 17—Under an arrangement between Erie County Farm Bureau Agent E. Victor Underwood and the State College of Agriculture at Ithaca, a tractor school was opened at 135 South Elmwood Avenue, Buffalo, March 15, and will continue until March 19, inclusive.

The instructors from the college explaining the use of the tractors, men of actual farm experience, are F. G. Behrends and A. M. Goodman. Behrends explained Monday the types of tractors, drivers, lugs, the gas engine, cycle, general survey, distribution of weight, types of drivers, control and accessibility of parts.

At Tuesday's session he explained the theory of gas-engine timing, study of cooling, governing, fuel and ignition systems. Goodman made clear the cooling, governing, fuel and ignition systems in detail. To-day the students were instructed in ignition, high tension, motor construction, transmission and lubricating.

Thursday and Friday a study will be made of horsepower on tractor ratings, the timing of valves and ignition, fuels and carburetors, pulleys and belts and belt speeds.

Among the tractors in use at the school are the International, Titan, Cleveland, Case, Fordson, Moline and Bates' Steel Mule Thirty.

Ford Gasoline Street Car Under Inspection

DETROIT, March 12—Henry Ford's new gas car, which it is proposed to install on the new municipally owned street railway lines, if Mayor Couzens' bond issue plan carries, was inspected yesterday at the Ford plant. Mayor Couzens and members of the council saw the body mounted on the chassis, and were given all the details of construction and operation by C. E. Sorensen, Ford's general manager.

Sorensen said it would be a month and probably six weeks before the car would be ready for the test run to Chicago over the Michigan Central tracks. The city officials were much impressed with the car, and it is believed the Ford car will prove a material factor in the voting on the bond issue.

Detroiters' confidence in Ford and in Sorensen, and the fact that the new street cars are to be built at home, is expected in a great measure to determine the issue.

KLEIBER TO MAKE TRUCKS

ATLANTA, GA., March 15—Kleiber trucks are to be manufactured in Atlanta in a big truck plant to be established here immediately by Paul Kleiber of San Francisco. Edward Kleiber, his brother, is in Atlanta to superintend the construction of the plant. A site comprising four and a half acres has been purchased at Peters and Park streets in the west end, where the White Hickory Truck and Hanson Motor Co. plants are located. Construction work is to begin immediately on what will be one of the biggest truck manufacturing plants in the South. It will be completed and in operation in a few months, Kleiber stated.

BRITAIN SELLS ARMY TRUCKS

LONDON, March 2 (*Special Correspondence*)—The British Ministry of Munitions in a recent statement says 17,806 Government owned trucks have been sold for $36,445,695, and 15,394 trucks continue under his control. This latter number includes trucks under repair at the Government works at Slough, near London, and others in use or stored in France and Germany.

Handley-Page to Build Small Plane

Plan $1,000 Vehicle to Compete With Motor Cars for Pleasure Riding

LONDON, March 2 (*Special correspondence*) — The sudden termination of the war produced a bad slump in the British aircraft indstry, and matters have gone worse since; one airplane maker after another having gone out of business or been forced to amalgamate with larger firms having "other strings to their bows."

Some British aircraft factories are building motor bodies, and some others are making furniture for much-needed houses. The Handley-Page Co. has in prospect a popular priced airplane, suitable for mass production and selling for not more than $1,000. Such a machine as plotted by the company's experts is expected to compete for popularity with motor cars.

The engine will be of 25 horsepower, and the fuel supply will be sufficient for five hours at 110 miles an hour. The Austin Motor Co., Birmingham, was early in the field with a popular airplane, but the price is just double that of the proposed Handley-Page.

ENGLISHMAN.

NEW WESTINGHOUSE BATTERY

PITTSBURGH, March 12—The Westinghouse Union Battery Co., recently formed, has taken three floors of the factory of the Union Switch & Signal Co. at Swissvale, but is expected soon to erect a plant of its own upon ground adjacent to the Swissvale works. The initial capacity of the shops will have from 1200 to 1500 batteries a day, with a working force of about 500 employees.

A. L. Humphrey, president of the Westinghouse Air Brake Co., is chairman of the board of directors of the organization; D. F. Crawford, vice-president and general manager of the Locomotive Stoker Co., is president, and T. S. Grubbs, vice-president of the Union Switch & Signal Co., is also vice-president of the new company, while T. R. Cook, one of the oldest battery construction engineers in this country, is vice-president and general manager.

TO START INDIA SAILINGS

NEW ORLEANS, March 14—Inauguration of a steamship service between New Orleans and India, with the first vessel to sail April 15, has been announced by M. H. Tracy & Co., steamship agents. The vessel will be a steel steamer and the rates in connection with the service and the ports of call for general cargo are: for Karachi, Bombay, Colombo and Calcutta, $1 10 per 100 lb. for all cargo stowing under 40 ft., and 70 cents per cu. ft. for cargo stowing 40 ft. or over; for Madras and Rangoon, $1.30 per 100 for cargo stowing under 40 ft. and 75 cents per cu. ft. for cargo stowing 40 ft. or over.

Strike Reaction Seen in England

Car Makers Turn to Drop Forging Methods to Supplant Castings

LONDON, Feb. 21 (*Special Correspondence*)—One of the results of the late molders' strike is seen in the marked interest in substituting press work for castings. The idea is that this step will enable non-union and unskilled workmen to be employed on work which at present is limited to more skilled workmen.

The E. W. Bliss Co., makers of giant presses, have a large number of big orders for presses for British motor firms, this despite the marked adverse rate of exchange. To illustrate this—a $50,000 press is now quoted here at $65,000 and the fact that this machine cannot be installed in time to be of much economic service to the present season's production is not considered.

Another significant sign of the times is that many British motor firms are not only looking more favorably to co-operative purchases of materials, etc., but of pooling mutual interests without sacrificing the distinctive features of any make. This step is being promoted by the Association of British Motor & Allied Manufacturers.

One more cosmopolitan trade body, the Society of Motor Manufacturers and Traders, Inc., has been formulating an internal code for the British motor trade, the details of which are nearly completed.

Another effort toward coordinating output costs has standardization for its aim, and the latest instance of it is the action of the British Machine Tools Trade Association in asking the British Engineering Standards Association to arrange a conference to discuss standardization of gears. In a note from that body reference is made to similar efforts and attention being given in the United States to this item of standardization.

It is hoped to formulate a plan as a basis for some scheme of mutual value. Accordingly, the conference asked for is to be held soon in the Institution of Civil Engineers' Hall.

ENGLISHMAN.

Charge Three With Unfair Competition

WASHINGTON, March 12—Complaints have been issued by the Federal Trade Commission against the National Wire Wheel Works, Inc., the Vacuum Oil Co. and the Valvoline Oil Co.

The National Wire Wheel Works, Inc., Hagerstown, Md., has been cited to answer a complaint of unfair competition in the manufacture and sale of wire wheels for automobiles. The company has forty days in which to file answer, following which the case will be set for trial. The complaint alleges false advertising by the company in holding out to the trade and the public that its products possess certain exclusive patented features.

The Vacuum Oil Co., New York City, has been cited in a complaint of unfair competition in the manufacture and sale of petroleum and its products, the company, it being alleged, giving rebates or accumulated discount to cause purchasers to confine their purchases exclusively to the company's products. The company has forty days in which to file a reply.

The Valvoline Oil Co., New York City, it is alleged, leases its devices and equipment with the understanding that the lessee will not use competitive oils or gasoline in the oil pumps, storage tanks and equipment which the Valvoline company leases. This concern has forty days in which to file a reply.

Siemens-Schuckert Develops New Plane

WASHINGTON, March 12—The German airplane company, Siemens-Schuckert, has sent one of its expert aviators to Stockholm, Sweden, to demonstrate a new type of Siemens-Halska biplane, according to a report received by the Air Service.

This machine is patterned after the scout type used by Germany during the war. It is equipped with a 240 hp. rotary Siemens-Halska motor. One of the peculiarities reported concerning the performance is that while the motor is running with the greatest number of revolutions, the propeller revolutions give double the r.p.m. of the motor, while another point is that the motor loses none of its effectiveness at great heights. This machine is capable of ascending 6000 meters in 15 min.

The machine has received great praise in Stockholm and is said to be especially adapted for couriers, police, customs work and sport.

BRITAIN AIDS AIRMEN

WASHINGTON, March 12—That the British Government is taking active steps to encourage civil aviation is shown by the recent announcement placing Hounslow airdrome at the disposal of civil air pilots and civil aviation concerns and by its more recent announcement that the Hounslow airdrome has been equipped for night flying for the convenience of civil aviators.

The airdrome is so operated that it flashes signals at night at a lighthouse, giving three flashes every 10 sec. and also operates ground searchlights and landing flashes. The flashes and searchlights will be operated when the airdrome is notified that machines intend to land or when airplanes are heard in the air.

HUDSON-ESSEX PRICES

DETROIT, March 13—New prices for Hudson and Essex cars have been announced as follows: 4- and 7-passenger Hudson phaetons, $2,400; Hudson sedan, $3,200; Hudson coupe, $3,375; Hudson touring limousine, $3,725; Hudson limousine, $4,075; Essex touring car and roadster, $1,545; Essex sedan, $2,450.

N. A. C. C. Requests Lower Car Tariffs

Would Encourage Imports as Trade Stimulus and Remove Prejudices Abroad

NEW YORK, March 12—The automobile industry, through the National Automobile Chamber of Commerce, has asked the Government to lower the import duty for its foreign competitors. The action was taken at a members' meeting of the Chamber in New York to-day at which it was announced that a canvass of 123 member companies had resulted unanimously in favor of the reduction of the tariff on imported cars costing $2,000 or over, from 45 per cent to 30 per cent.

A memorandum has been sent to the Tariff Commission at Washington setting forth the reasons why such action is felt to be in the interest of the industry as well as business generally. The industry believes that the encouragement of importation should prove helpful to the present serious exchange situation, and is not to be feared by a home industry of the size and strength of automobile manufacturing.

It is pointed out that prejudice is bound to persist against the American product in foreign markets while our tariff is held at its present high rate, and that the outcome would be a disposition on the part of other automobile manufacturing nations to retaliate with equally high tariffs, probably discriminating against the United States. It is hoped that, it being the avowed wish of the industry to have the duty lowered, Congress may be persuaded to consider a downward revision of this item at the present session.

The makers appreciate that a lower duty will bring in more foreign cars, but rather welcome the competition as a stimulus to continue America's leadership in all types of motor cars. This country now produces 85 per cent of the world's supply of motor vehicles.

There also was an expression of gratification at the meeting that the House has defeated the proposed withdrawal of the foreign commercial attaché service, so much needed in the export trade, and that, instead, the Department of Commerce is to be accorded an increased appropriation for an extension of its very valuable work of investigation in foreign fields.

GEMCO TO DOUBLE OUTPUT

MILWAUKEE, March 13—The Gemco Mfg. Co., 742 South Pierce Street, Milwaukee, is erecting a 2-story plant addition, 50 x 170 ft., which will enable it to increase its output of bumpers, windshields and other automotive equipment about 50 per cent, equivalent to $2,000,000 per annum. The enlargement is made necessary by a marked increase in export demand from South America, Philippine Islands, Java and Mexico, as well as from domestic sources. The output is distributed through jobbers only.

Tax Decrease Swells Kelly Tire Surplus

SPRINGFIELD, MASS., March 12—Reduction of Federal tax requirements in 1919 result in an increase in the surplus of the Kelly-Springfield Tire Co., over 1918, according to the annual report of the company recently issued. Actual net profits for the year were lower than in 1918.

Gross profits for the year were $7,034,284, as compared with $7,187,834 in 1918. This was ascribed to increased manufacturing and other costs rather than to any falling off in business. Operating expenses of $3,776,735 were more than a million higher than in 1918, so that net profits before Federal taxes last year were $3,532,088; $1,057,677 lower than the $4,589,765 for 1918.

Federal taxes on 1919 were only $814,275 or less than one-third that item in 1918, which was $2,657,492. For this reason surplus after all charges in 1919 was $2,422,522 compared with $1,707,735 in 1918.

SHERARDIZING FIRM TO MOVE

NEW HAVEN, CONN., March 12—The New Haven Sherardizing Co. will shortly remove to Hartford where a larger and more adequate plant has been secured which will provide good shipping facilities. The concern is engaged in the process of dry galvanizing metal parts to prevent rust. The business was begun in 1910 under English patent rights and was developed largely with Hartford capital. The company makes a specialty of mandrels for the manufacture of automobile inner tubes and is doing business with over 200 tire companies in the United States and Canada. The company also designs and installs small plants for manufacturers for treating their own products. Edwin Y. Judd is president of the company; Judson H. Root, vice-president; Wesley I. D. Charter, treasurer, and John F. Forward, secretary—all of Hartford.

KARAVAN BUILDS TRUCK

PORTLAND, ORE., March 15—The Karavan Motors Co. has been organized in Portland for the manufacture of a heavy duty motor truck to be known as the Karavan. Several of the trucks have been built and are in operation. The factory and assembling plant is at the Hesse-Martin Iron Works. While the Karavan is an assembled truck, such parts as the frame cross members, aluminum castings for radiator core, and hub caps are made here. The units used in the truck include Buda motor, Brown-Lipe transmission and clutch and Sheldon worm drive and axles.

E. D. Van Dersal, for the past ten years a motor car and truck salesman, dealer and distributer in Portland, is president of the Karavan Motors Co.; Fred Hesse, of the Hesse-Martin Iron Works, vice-president and consulting engineer; Whitney L. Boise, secretary, and George H. Peters, engineer in charge of construction.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

Keystone Truck Takes Over Commercial Car

PHILADELPHIA, March 12—The Keystone Motor Truck Corp. has been organized to manufacture automobile trucks and, among other things, has taken over the assets of the Commercial Car Unit Co., Philadelphia.

The corporation has the following officers: H. B. Harper (of the Overland Harper Co.), president; M. S. Cooper (formerly manager commercial car division, Willys-Overland factories), vice-president in charge of sales; C. W. Binns (formerly secretary and treasurer of the Commercial Car Unit Co.), treasurer, and Allan N. Mann, secretary. The following directors have been elected: J. Kearsley Mitchell, H. B. Harper, M. S. Cooper, P. I. Harper and A. E. Nash.

The corporation has acquired a property at Oaks, Pa., having both Pennsylvania and Philadelphia & Reading Railways connections, and is completing its factory buildings, which should be ready for occupancy April 1. Headquarters will be in Philadelphia.

The present production of one and two-ton Keystone models has been sold ahead until May 1, at which time increased facilities will permit immediate deliveries on both models to be made.

FORM NEW TRACTOR COMPANY

EAU CLAIRE, WIS., March 12—The Inland American Tractor Co. has been organized in Eau Claire, Wis., by members of the R. D. Nuttall Co., Pittsburgh, manufacturing gears, supported by St. Paul and local capital. It is hoped to start production of a four-bottom tractor, known as the "Cata Gripper," by July 1, for early fall deliveries. A. A. Robbins of St. Paul will be president of the new company. R. D. Nuttall, president; Milton Ruppert, vice-president, and Lester H. Keim, general manager, respectively, of the Nuttall company, are among the principal stockholders. Eau Claire capital is represented by R. B. Gillett, Edward Hutchens, J. B. Hubbard, A. P. Hensen and R. L. Meader.

JOBBING FIRM ORGANIZED

NEW YORK, March 12—A. S. Flanagan, who has been 15 years with Charles E. Miller, 97 Reade Street, jobber of automotive equipment, and W. A. Pendersen, also with that firm for many years, have resigned and organized the P. & F. Auto Supply Co., with temporary headquarters at 35 Warren Street. They are entering the general jobbing, exporting and wholesale business, and are soliciting catalogs.

Bosch Institutes New Welfare Policy

SPRINGFIELD, MASS., March 12—According to announcement made this week, employees of the American Bosch Magneto Corp. of this city will receive a $500 life insurance policy, in addition to sick benefits. Sick benefits will range from $9 to $20 per week, according to wages received by those who have been in the service of the corporation continuously for 60 days, or more. An additional $100 will be added to the insurance policy until the maximum of $1,000 is reached.

The association is to be governed entirely by employees with their own executive committee into sick and auditing committees, which will investigate and adjust all claims. In addition to the first aid treatment, the company has arranged to provide the services of a physician, dentist and nurse for families of employees. The work has already been started and has proved effective in the care of families in which members are ill with influenza.

High Costs Suspend Work on Tractor Plant

JANESVILLE, WIS., March 12—The General Motors Corp., on March 1, ordered building operations at its Samson Tractor Co. works in Janesville, Wis., stopped indefinitely because of the scarcity and high price of labor, the scarcity and abnormal cost of materials, and the inability to induce adequate provision for housing accommodations.

According to J. A. Craig, president and general manager of the Samson company, the manufacturing program will be carried out with the existing facilities, representing an investment of $7,700,000 and providing for the complete assembly of tractors. Work on the big foundry and additional machine shops will be resumed as quickly as harassing conditions are remedied and the construction of dwellings approaches more nearly the requirements.

TAKES OVER WHEEL SALES

BALTIMORE, March 12—The Maryland Pressed Steel Co. of Baltimore and Hagerstown, Md., has taken over the manufacture and sale of National and Pasco wire wheels, the product of the National Wire Wheel Works, Inc. Through an exclusive license agreement covering a long term, the manufacture and sale of these wheels and their component parts is centered in the one company. The Maryland Pressed Steel Co. has been manufacturing National and Pasco wire wheels during the last year, and the National Wire Wheel Works, Inc., has conducted the selling.

PEN BROECK REORGANIZES

LOUISVILLE, KY., March 12—The Pen Broeck Tyre Co. has undergone a reorganization and is putting on the market an improved Pen Broeck "Thoroughbred" tire and also a line of tubes.

Schweinert Elected to Head A. Schrader's Son

NEW YORK, March 12—M. Charles Schweinert has been elected president of A. Schrader's Son, Inc., by directors at a special meeting this week, to succeed Dr. Charles K. Cole, who died recently at Pasadena, Cal. Schweinert has been employed with the company for thirty-four years, latterly holding important official positions.

The new president of the company has been responsible for the development of many new designs in tire valves, in which the company specializes, his latest valve being a high pressure valve for service on heavy pneumatic tires designed for truck service.

Air Veteran Named Curtiss Saleshead

NEW YORK, March 12—Maurice Connolly of Dubuque has been appointed general salesmanager of the Curtiss Airplane & Motor Corp., succeeding J. C. Davies, who resigned recently to enter the airplane distributing field. Connolly held a major's commission in the air service and before the outbreak of the war served one term in Congress as representative from the Third Iowa district. He and F. H. LaGuardia, now president of the New York Board of Aldermen, bear the distinction of being the only two men in the United States with the dual honor of having served in Congress and received their flying wings.

TITUS ON RENAULT STAFF

NEW YORK, March 12—As an indication that plans for a large scale business in Renault products in this country are rapidly maturing, there is much of interest in the appointment by George B. Warner, general manager of the Renault factotry branch here, of Fred J. Titus as sales manager. Titus is a veteran in the automotive business in this country and has long been identified in a prominent way with the marketing of high grade automobiles.

The post-war line of Renault products includes several models each of passenger cars, motor trucks, tractors, aeroplanes and aviation motors, marine motors, stationary engine sets, electrical automotive equipment, etc. It thus affords a wide scope for the ripe experience and rare ability which Titus brings to his new connection.

JEFFERS JOINS FIRESTONE

TORONTO, March 13—R. H. Jeffers has been appointed general manager of the Firestone Tire & Rubber Co. of Canada, Ltd., at Hamilton. The company has purchased a 135-acre site, which will be known as Bartonville. On one half of the site will be built a large plant with a floor space of about 320,000 sq. ft. The remainder of the site will be used for model houses, community halls and stores for employees of the company.

Men of the Industry

Changes in Personnel and Position

F. C. Steward has been appointed advertising manager of Beneke & Kropf Mfg. Co., Chicago, makers of Rayfield carbureters. Steward formerly was advertising manager of the McDagell Co., Frankfort, Ind.

R. C. Sackett, formerly advertising manager for the Studebaker corporation at South Bend, has entered the trade in Cincinnati. He is interested in E. S. Gahagan & Co., Studebaker distributers.

E. F. Benson, formerly of Detroit, has been appointed manager of the Fisk Rubber Company branch at 1725 Broadway, New York. Until January of this year Benson was associated with the Ajax Rubber Co. as district manager at Detroit. Since then he has been connected with the Fisk company.

G. H. Dalrymple, for the past three years purchasing agent of the Spacke Machine & Tool Co., Indianapolis, makers of lightweight cars, automobile axles and automotive equipment, has resigned his position, effective May 1.

O. L. Formingle, research engineer of the Fifth Avenue Coach Co., has joined the Wichita Falls Truck Co., Wichita Falls, Tex., as chief engineer.

Will H. Ritter, sales representative with the English & Mersick Co., New Haven, has been appointed second vice-president and salesmanager.

R. A. Kiken has been appointed service manager of the engine division of the Buda company.

Edward F. Babcox, sales manager of the Rubber Products Co. of Barberton, Ohio, has resigned to accept the vice-presidency and a directorship in the Akron Advertising Agency Co. of Akron.

THREE YEAR TRADE TRIP

KOKOMO, IND., March 13—Leonide Barrere, an exporter and engineer, has been engaged by the Haynes Automobile Co., as special travelling export representative. After a month's stay at the Haynes factory, Barrere will leave on a three years' trip to the important cities in Europe, Asia, Africa and South America.

Barrere is a graduate electrical and mechanical engineer. His linguistic attainments include a knowledge of seven languages.

LEWIS NAMES PERSONNEL

FOSTORIA, OHIO, March 12—The Lewis Motor Mfg. Co., maker of the Lewis Ultra-Six marine engine, has announced the following personnel: Ralph D. Lewis, president; R. C. Gilbert, vice-president; Edward J. Bouchard, treasurer; Joseph E. Pratt, secretary, and Charles S. Monson, salesmanager.

LaFayette Perfects Distributing Plans

INDIANAPOLIS, March 13—E. C. Howard, vice-president of LaFayette Motors in charge of the distributing organization, announced several connections with prominent distributers who will handle D. McCall White's new eight-cylinder car. C. P. Rockwell, head of C. P. Rockwell Inc., 640 Commonwealth Avenue, Boston, one of the best known dealers in New England, has secured the Boston territory.

Greer-Robbins Co., Hupmobile distributers on the Pacific Coast, have been given the distribution for northern California with headquarters in Frisco. The lower half of the state will be handled by the Troy Motor Sales Co., headed by John J. Troy and manager Harry J. Coger, both prominent in automotive circles on the Coast.

Exclusive representation in Pittsburgh has been given the H. H. May Motor Co. Associated with May is J. L. Costella. Hayward-Cameron Co. will handle the LaFayette in Omaha. The Walker Motor Co., composed of John C. and his son J. Curtis Walker, will have charge of distribution in the nation's capital. J. Henry Smith, head of the LaFayette-Smith Motors Co., is Chicago distributer, and Hugh T. Porter holds the New York territory. Business will be operated under the name of the Porter-LaFayette Co.

The Losey-LaFayette Motors Co., headed by R. H. Losey, gets the Indianapolis distribution, and R. A. Niccolls and R. B. Bush, operating under the name of LaFayette Motors, will represent the company in Kansas City territory.

McCOMB JOINS McCORD

DETROIT, March 13—Henry G. McComb has been appointed general manager of the Russel Motor Axle Co. by the McCord Mfg. Co., Inc., which now owns and operates that company in addition to its other old and recently acquired interests. McComb, who was associated with many of the pioneer automobile builders, recently returned from Europe, where he went in the interest of prominent eastern truck builders to investigate European practice in truck design, particularly pertaining to axles.

The recent purchase of the Racine Mfg. Co., body makers of Racine, Wis., in addition to the axle unit, adds two important automobile parts to the already considerable variety of McCord products.

HEADS M.-P. ENGINEERS

INDIANAPOLIS, March 15—James McGlashan, who for two years has been head of the engineering department at the York, Pa., plant of the Martin-Parry Corp., recently was advanced to the position of chief engineer of this corporation, and will make his headquarters at the York factory.

In his new position he assumes charge of the designing and engineering departments at the Martin-Parry plants at York and Indianapolis.

Calendar

SHOWS

Mar. 20-27—Trenton, N. J. Annual Automobile Show. Armory. Trenton Automobile Dealers' Assn. John L. Brock, Manager.

Mar. 20-27—Pittsburgh. Motor Square Garden. Automotive Association, Inc. John J. Bell, Manager.

Mar. 22-27—Duluth, Minn. Automobile Show. Duluth Auto Trades Assn. W. F. Daly, Director.

Mar. 22-27—Utica, N. Y. Annual Automobile Show, Utica Motor Dealers' Association.

Mar. 22-27 — Oklahoma City, Okla. Annual Automobile Show. Oklahoma City Motor Car Dealers' Assn. G. W. Woods, Manager.

April 21-28—San Francisco. National Aeronautic Exposition. Exposition Auditorium.

Oct. 6-16—New York. Electrical Show. Grand Central Palace. George F. Parker, Manager.

FOREIGN SHOWS

April 3-May 4—Buenos Aires. Exposition of U. S. manufacturers.

May 15-June 13 — Cars, Parts and Accessories. Antwerp.

June 26-July 25 — Commercial vehicles, tractors, camions and engines. Antwerp.

July 9-20—London, England. International Aircraft Exhibition. Olympia. The Society of British Aircraft Constructors.

Aug. 7-Sept. 15 — Motorcycles, sidecars, etc. Antwerp.

October—London. Commercial Vehicle Show, Olympia.

November—London. Passenger Car Show, Olympia.

CONTESTS

August, 1920—Paris, France. Grand Prix Race. Sporting Commission Automobile Club of France.

June, 1920—Omaha, Neb. Reliability Truck Tour.

CONVENTIONS

April 27-29—Atlantic City. Increased Production Convention, Chamber of Commerce of the United States.

May 9-12—Independent American Petroleum Congress, Congress Hotel, Chicago.

May 12-15, 1920—San Francisco. Seventh National Foreign Trade Convention.

S. A. E. MEETINGS

Mar. 23—Buffalo Section Meeting. Subject—Combustion of Fuels in Internal Combustion Engines. J. H. Hunt, Dayton Engineering Laboratories.

Mar. 25—Pennsylvania Section Meeting. Subject — High Speed at Great Altitudes, Com. H. C. Richardson, U. S. N.

Mar. 26 — Mid-West Section Meeting, Auditorium of the Western Society of Engineers.

April 7—Minneapolis Section Meeting. Subject—Tractor Weight and Drawbar Pulls.

April 8—Metropolitan Section, Automobile Club of America, New York. Subject—A Study of Tire Deflection and Unsprung Weight in Trucks. Speaker, A. F. Masury. Illustrated.

Bus Lines to Start in Detroit May 15

DETROIT, March 12—Motorbus transporation will start in Detroit May 15. The first line will be on Woodward Avenue, and a complete unit of 20 buses, with repair shop and other equipment, will arrive in Detroit the first week in May from New York, where they are being constructed.

The company plans two and one-half minute service, with a seat for every passenger. Seating capacity of the double-deck cars to be installed will be 48 persons, and when all seats are filled no stops will be made until vacancies begin to occur. Fares will be 10 cents.

As evidence of the popularity of the motorbus in Detroit, many factory executives have appealed to the promoters to open lines to their plants, and this will be done wherever possible, just as rapidly as equipment can be secured. Routes will be extended to those parts of the city only where there is no street car service, or where it is inadequate.

Co-operation of the Board of Commerce, the Retail Merchants' Bureau and other civic organizations assures success for the enterprise. The personnel of the company includes some of the most prominent business men in Detroit.

TO OPEN IN CANADA

WALKERVILLE, ONT., March 12—Kales Stamping Co., Detroit, is preparing to open up a Canadian factory, it is understood, for the manufacture of automobile mirrors.

A. A. A. Sanctions Twenty-Seven Races and Two Tours for 1920

NEW YORK, March 12.—Speedway and dirt track events for the spring, summer and fall of 1920, sanctioned by the A. A. A., have just been announced. Important among the events scheduled are the Los Angeles, Indianapolis, Uniontown, Tacoma and Cincinnati races; the Truck Reliability Tour, conducted by the *Omaha Bee*, and the Glidden Tour, New York to San Francisco.

A list of all sanctioned events with the dates thereof follows:

March	21	Speedway—Los Angeles, Cal.	Los Angeles Speedway Assn.
May	1	Dirt Track—Hanford, Cal.	Hanford Board of Trade
May	31	Speedway—Indianapolis, Ind.	Ind. Motor Speedway Co.
May	31	Dirt Track—Brockport, N. Y.	Frank G. Bell
June	1	Truck Reliability Run—Omaha, Neb.	Bee Publishing Co.
June	12	Speedway—Uniontown, Pa.	Uniontown Speedway Assn.
June	17	Dirt Track—Portland, Ore.	Robert A. Hiller
June	19	Dirt Track—Ogdensburg, N. Y.	Frank G. Bell
July	4	Speedway—Tacoma, Wash.	Tacoma Speedway Assn.
July	4	Dirt Track—Hanford, Cal.	Hanford Board of Trade
July	4	Dirt Track—Spokane, Wash.	Robert A. Hiller
July	5	Dirt Track—Batavia, N. Y.	Frank G. Bell
July	17	Dirt Track—Warren, Pa.	Frank G. Bell
July	24	Dirt Track—Watertown, N. Y.	Frank G. Bell
July	31	Dirt Track—Fulton, N. Y.	Frank G. Bell
Aug.	7	Dirt Track—Erie, Pa.	Frank G. Bell
Aug.	14	Dirt Track—Buffalo, N. Y.	Frank G. Bell
Aug.	21	Dirt Track—Johnstown City, Pa.	Frank G. Bell
Aug.	28	Dirt Track—Canandaigua, N. Y.	Frank G. Bell
Aug.	20-21	Dirt Track—Middletown, N. Y.	Horace P. Murphy
Aug.	27-28	Dirt Track—Flemington, N. J.	Horace P. Murphy
Sept.	1	Glidden Tour—N. Y. to San Francisco.	Contest Board A. A. A.
Sept.	6	Dirt Track—Hornell, N. Y.	Frank G. Bell
Sept.	6	Speedway—Cincinnati, Ohio	Cincinnati Speedway Co.
Sept.	6	Speedway—Uniontown, Pa.	Uniontown Speedway Assn.
Sept.	17-18	Dirt Track—Syracuse, N. Y.	Horace P. Murphy
Sept.	25	Dirt Track—Allentown, Pa.	Horace P. Murphy
Oct.	1-2	Dirt Track—Trenton, N. J.	Horace P. Murphy
Oct.	8-9	Dirt Track—Danbury, Conn.	Horace P. Murphy

Illinois Holds Road Work to Minimum

CHICAGO, March 13—Pulling Illinois out of the mud is a task which seems fraught with unusual difficulties, and its accomplishment is once more delayed. At a conference between officials this week in Springfield, and with the approval of Gov. Frank O. Lowden, it was decided to confine Illinois' road building activities for 1920 to two projects, totaling thirty-nine miles of roadway.

Mounting costs of road construction are the cause of the latest Illinois delay. When the famous Illinois State bond issue of $60,000,000 was first proposed five or six years ago, road costs were estimated as considerably under $20,000 per mile. When the bond issue was voted in 1918, road enthusiasts regretted they had not asked for $120,000,000 rather than $60,000,000. Now it is estimated that it would cost about $200,000,000 to carry through the program originally outlined.

Bids were asked for numerous projects this spring, and the lowest bid submitted called for $42,000 per mile of construction, while the average cost per mile for all work which was proposed was approximately $44,000. These high costs decided State road officials to call off the road program until costs were lower, and the only work which will be done this year will be along the Dixie Highway and National Old Trails road, for both of which there is considerable Federal Aid money available.

CLAROTTA TO MAKE CARS

MILWAUKEE, March 15—The Clarotta Mfg. Co. of Milwaukee is the name of a new $1,000,000 corporation organized under the laws of Wisconsin by Walter A. Kuebler, Otto G. Pfeifer and Thomas C. Hanson, 682 Fifty-first Street, to engage in the manufacture of motors, motor vehicles, automotive equipment, machinery, etc. The project has not matured sufficiently to make possible a detailed explanation of its purposes at this time.